Julian

Anaesthetic Workstation

Instructions for Use
Software 3.n

How to use these Instructions for Use

In the header is the subject…
of the main chapter.
Underneath is the title of the subchapter, to help you find your way around quickly.

On each page…
the instructions for use
combining text with illustrations. The information is translated directly into actions to enable the user to learn „hands-on“ how to use the workstation.

Left-hand column: the text…
provides explanations and guides the user clearly and ergonomically with brief directions on the use of the product.
Bullet points indicate the steps to be followed, and where there are several steps, numbers refer to the illustration and indicate the sequence.

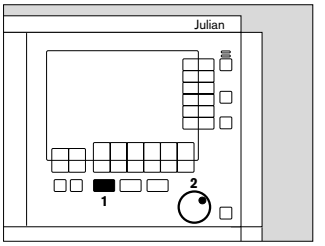
Right-hand column: the illustration…
provides the link with the text and serves as a guide to the workstation. Points mentioned in the text are emphasised and non-essential information is omitted.

Screen displays guide the user and confirm the steps to be followed.

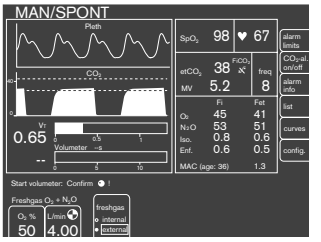
Operation
Selecting the ventilation mode
MAN/SPONT

1 Press the »MAN/SPONT« key,

2 and confirm with the rotary knob.



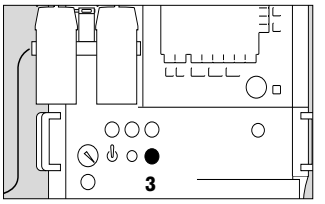
Display (example):



O2 flush

– For flushing and rapidly filling the breathing system and breathing bag with O2 while bypassing the Vapor unit.

3 Press the »**O2 +**« button.
O2 flows into the breathing system without anaesthetic gas as long as the button is held down.



Contents

For Your Safety and that of Your Patients

Strictly follow the Instructions for Use

Any use of the apparatus requires full understanding and strict observation of these instructions.
The apparatus is only to be used for purposes specified here.

Maintenance

The apparatus must be inspected and serviced regularly by trained service personnel at six monthly intervals (and a record kept).
Repair and general overhaul of the apparatus may only be carried out by trained service personnel.
We recommend that a service contract be obtained with DrägerService and that all repairs also be carried out by them. Only authentic Dräger spare parts may be used for maintenance.
Observe chapter "Maintenance Intervals".

Accessories

Do not use accessory parts other than those in the order list.

Not for use in areas of explosion hazard

This apparatus is neither approved nor certified for use in areas where combustible or explosive gas mixtures are likely to occur.

Safe connection with other electrical equipment

Electrical connections to equipment which is not listed in these Instructions for Use should only be made following consultations with the respective manufacturers or an expert.

Liability for proper function or damage

The liability for the proper function of the apparatus is irrevocably transferred to the owner or operator to the extent that the apparatus is serviced or repaired by personnel not employed or authorized by DrägerService or if the apparatus is used in a manner not conforming to its intended use.

Dräger cannot be held responsible for damage caused by non-compliance with the recommendations given above. The warranty and liability provisions of the terms of sale and delivery of Dräger are likewise not modified by the recommendations given above.

Dräger Medizintechnik GmbH

Intended Use

Contents

Intended Use

Julian Anaesthetic Workstation for patients with a body weight of 5 kg and over with the use of IPPV ventilation.

For the use of:

- Inhalation anaesthesia in rebreathing systems
- Inhalation anaesthesia in semi-closed to virtually closed systems with "low flow" and "minimal flow" techniques (for minimal gas and anaesthetic agent consumption).
- Inhalation anaesthesia in non-rebreathing systems, with separate fresh gas outlet for the connection of e.g. the Bain system or Magill system

with a fresh gas flow of 0.5 to 12 L/min.

Ventilation modes:

- Automatic ventilation (IPPV)
  and
  pressure-controlled ventilation (PCV).
- Manual ventilation (MAN).
- Spontaneous ventilation (SPONT).

The following measured values are displayed:

- Peak pressure, mean pressure, plateau pressure and PEEP
- Expiratory minute ventilation
  Tidal volume V_T
  Breathing rate
  Patient compliance
- Inspiratory and expiratory concentration of O_2, N_2O, anaesthetic gas and CO_2

optional:

- Functional oxygen saturation (SpO_2) and pulse rate.

The following parameters are displayed as curves:

- Airway pressure
- Expiratory flow
- Inspiratory and expiratory concentration of O_2, CO_2 and anaesthetic gas

optional:

- Plethysmogram

Trend curves and measured value lists are also available.

Monitoring
by means of adjustable alarm limits that are automatical adapted to the ventilation mode.

The workstation may only be used under the supervision of qualified medical personnel, so that assistance can be provided immediately in the event of any malfunctions.

Explosive anaesthetics, such as ether or cyclo-propane, must not be used due to the risk of fire.

Mobile radio telephones must not be used within 10 metres of the workstation!
Mobile telephones may interfere with the operation of electrical and electronic medical equipment.*

Julian must not be used with nuclear spin tomography (MRT, NMR, NMI)!
Operation of the apparatus may be impaired.

* Dräger medical equipment fulfils the interference resistance requirements according to the product-specific standards or EN 60601-1-2 (IEC 601-1-2). However, depending on the desig of the mobile phone and circumstances of use, field strengths may occur in the immediate environment of a mobile phone that exceed the limits of the above standards and therefore cause interference.

Operating Concept

Contents

Operating Concept

Screen ergonomics

All the settings required for

– Fresh gas delivery

– Ventilation

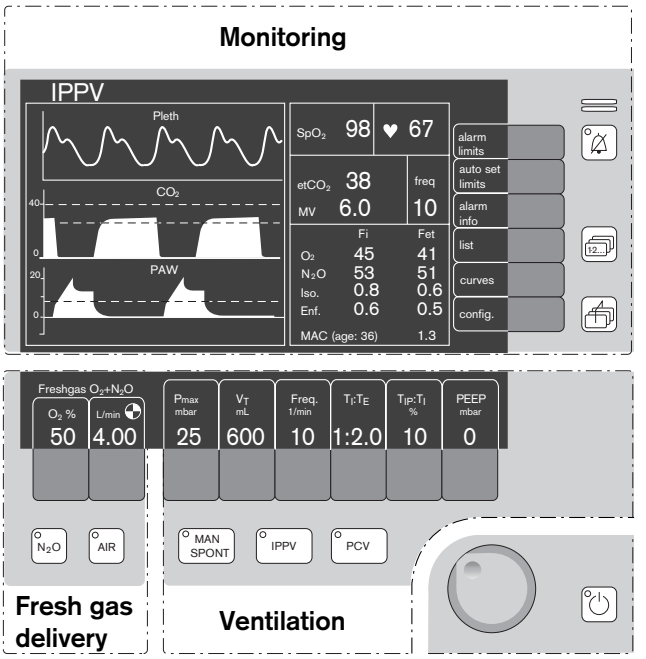
– Monitoring

are entered on the system screen using the appropriate keys and the rotary knob.
The keys are grouped in function fields:

Left-hand field
Fresh gas delivery

Right-hand field
Ventilation

Middle field
Monitoring

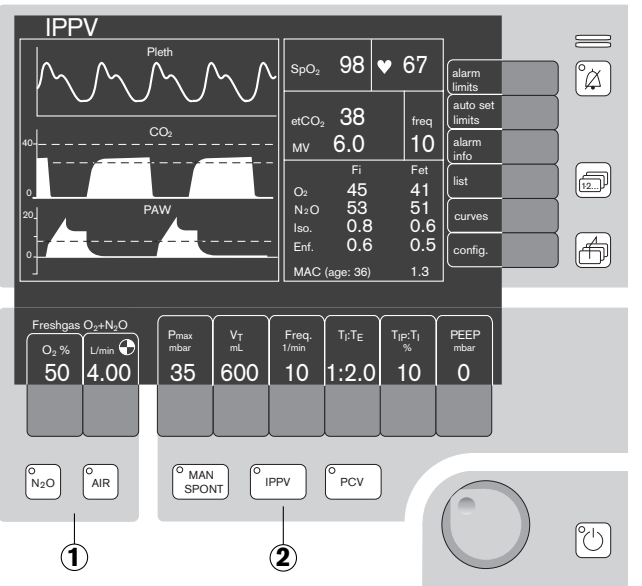


The main functions for anaesthesia, e.g. selection of N_2O or AIR, or selection of ventilation modes, can be selected directly by keys with permanently defined functions ("hardkeys"):

1 Left-hand block
The **»N_2O«** or **»AIR«** keys are used to select the gas to be mixed with O_2 for the fresh gas mix.

2 Right-hand block
The **»MAN SPONT«**, **»IPPV«** or **»PCV«** keys select the ventilation mode.

These function keys are located in the bottom row on the control panel.
Left-hand block for fresh gas setting
Right-hand block for ventilation



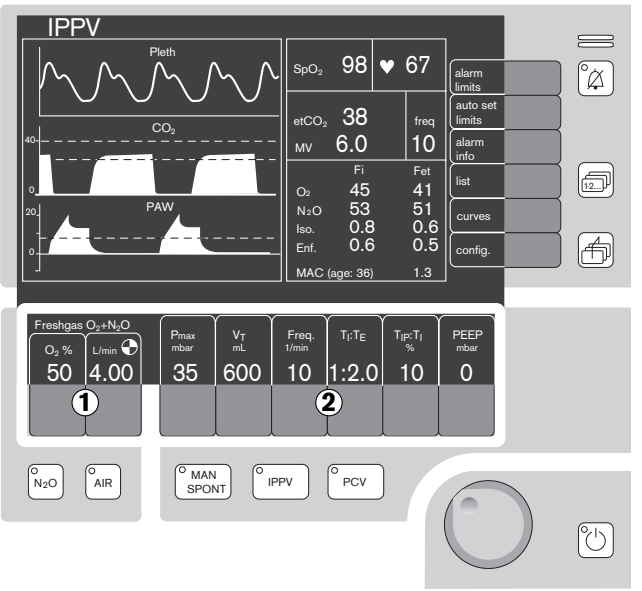
Complementary "softkeys" with variable functions are provided at the bottom edge of the screen, above each group of hardkeys. These softkeys are used to set the fresh gas delivery parameters and ventilation parameters.

1 Left-hand block:
The keys for setting the O_2 concentration and fresh gas flow.

2 Right-hand block:
The keys for setting the parameters for the relevant ventilation mode. The example shows the parameters for IPPV controlled ventilation.

These softkeys have different functions, depending on the operating status or ventilation mode.

The current parameter values are displayed in the softkey field.



In a prominent position at the bottom right-hand side:

The "turn-and-push" rotary knob
is the main operating control of the apparatus and has the following functions in all setting operations:

3 select = turn

4 confirm = press

– to confirm the selected carrier gas or a ventilation mode,

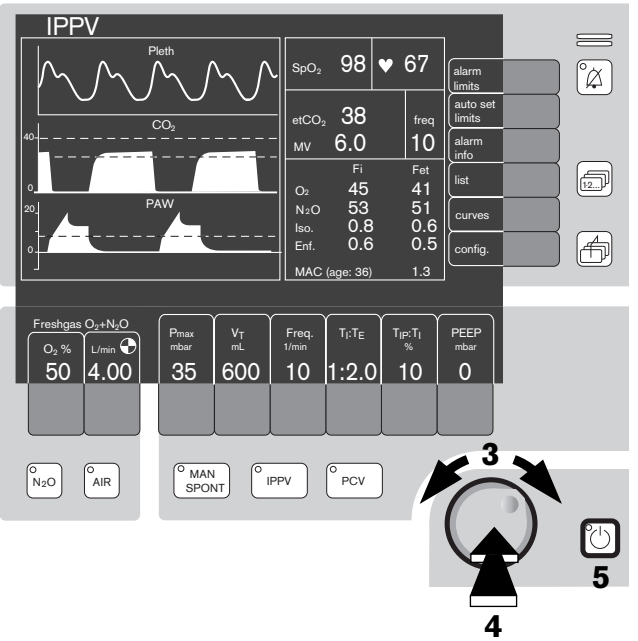
– to set and confirm the parameters for fresh gas and ventilation modes,

– to set and confirm the monitoring functions.

Beside the rotary knob:

The standby key ⏻ for switching over to standby mode.

5 Press standby key ⏻ and confirm by pressing the rotary knob.



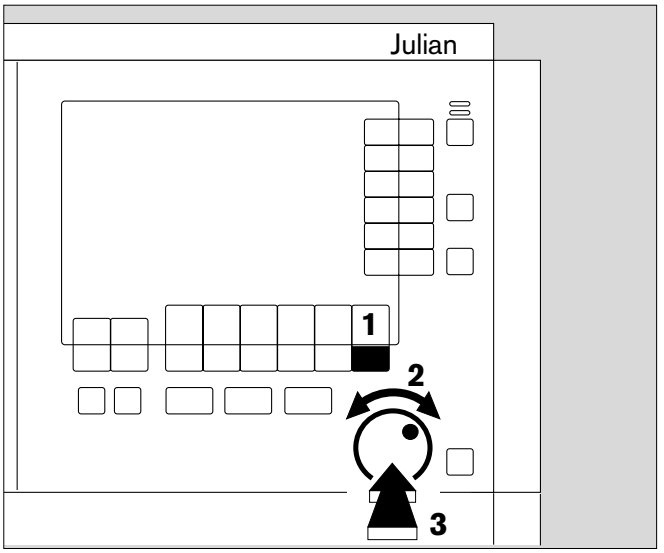
Selecting / setting ventilation parameters

Example: PEEP ventilation parameter

1 Press the softkey »**PEEP**«.

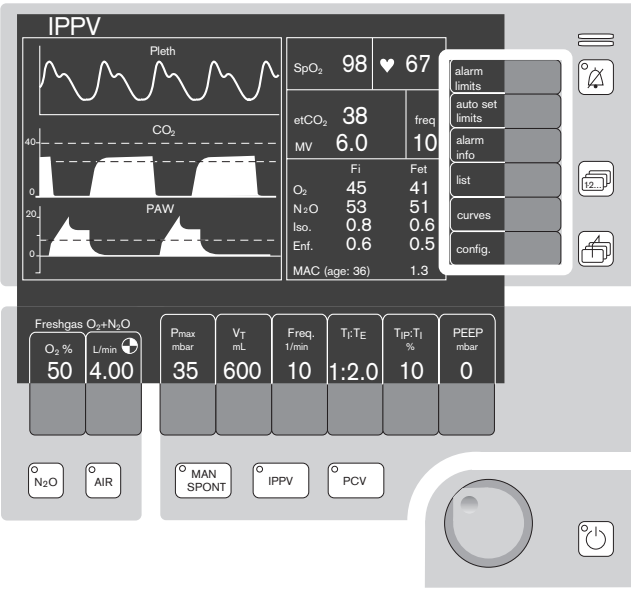
2 Select the PEEP value = turn the rotary knob.

3 Confirm the PEEP value = press the rotary knob.



The keys for the various monitoring functions are located on the right-hand side of the screen.

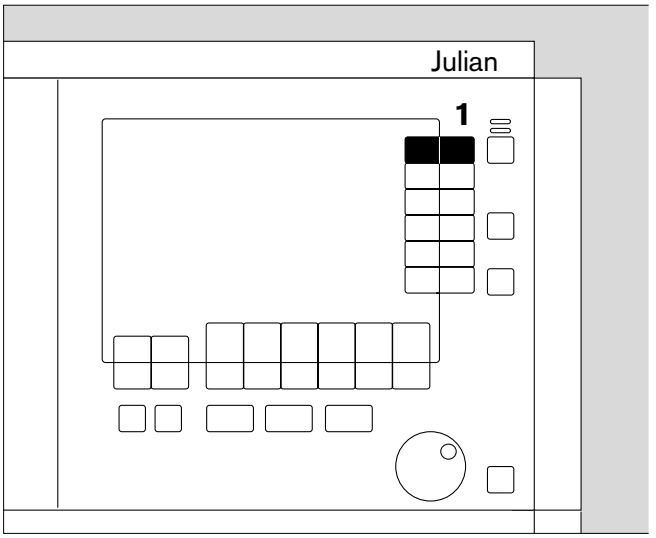
These keys also have different functions = softkeys, depending on the monitoring screen required.

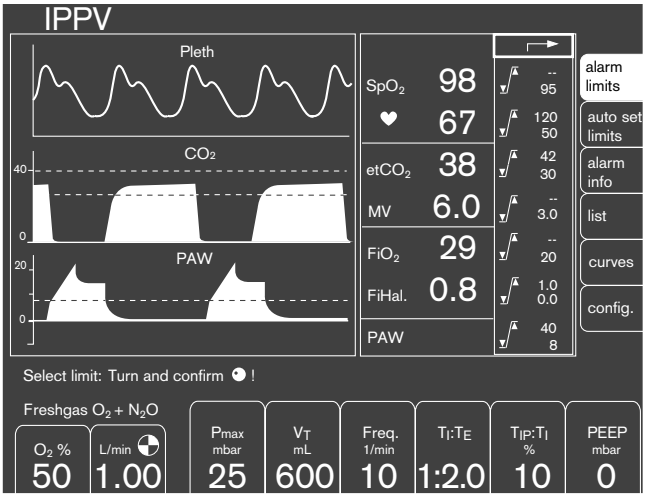


Selecting / setting monitoring functions

For example, to change the lower alarm limit of the end-tidal CO_2 concentration.

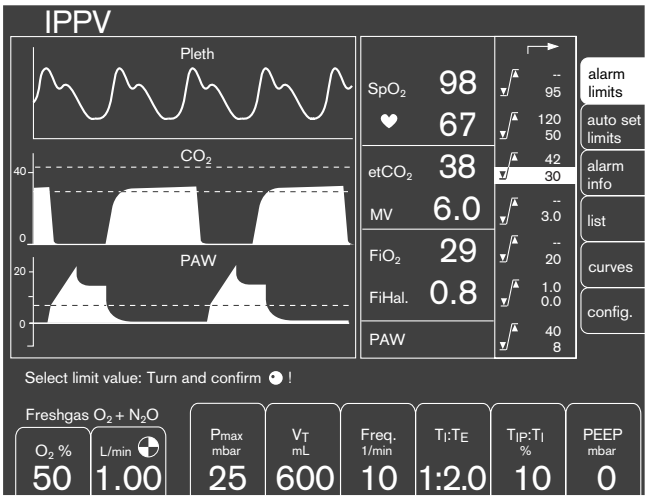
1 Press the »**alarm limits**« softkey. The **alarm limits** menu is displayed on the screen.





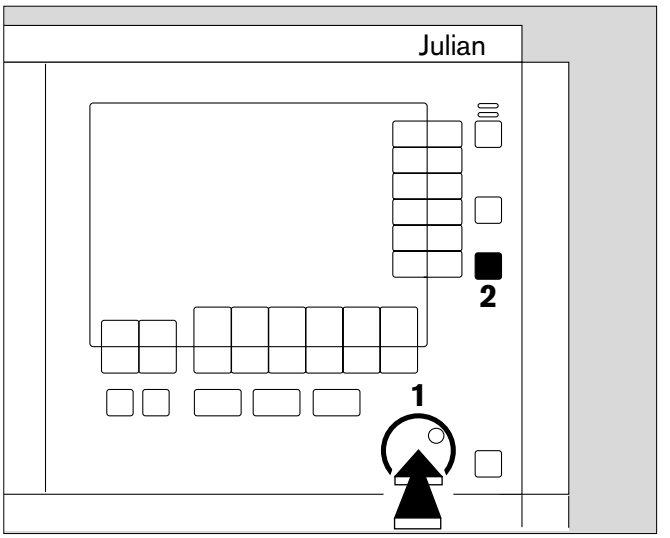
- Select the alarm limit value = turn the rotary knob.
  Confirm the selection = press the rotary knob.

  The limit value is highlighted.
  Example: lower alarm limit etCO2: ↓30
- Set the alarm limit value = turn the rotary knob.
- Confirm the new alarm limit = press the rotary knob.
  The cursor returns to the ⌐→symbol.



Exit the **alarm limits** menu:

1 Press the rotary knob
or
2 Press the key.

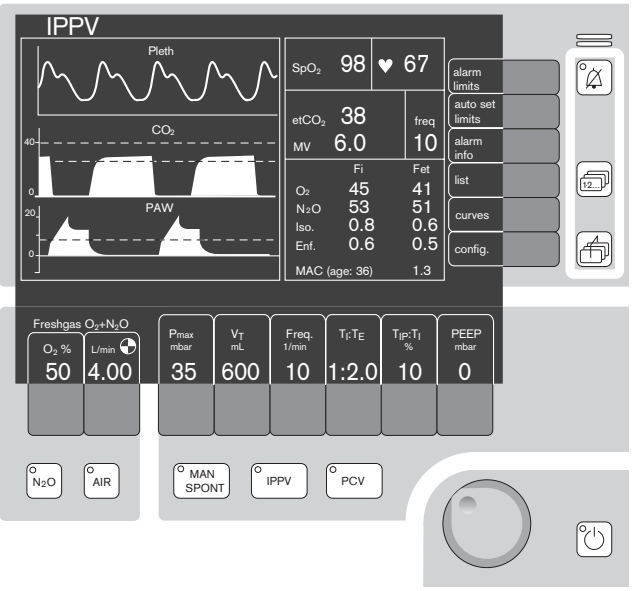


The function keys for standard functions are located on the right-hand side of the control panel.

Suppress the acoustic alarm for 2 minutes.

Select the screen page.

Back to standard page.



Screen layout

① Status field:
Displays information on the current operating mode

② Graphics field:
For curves and bargraphs

③ Alarm field:
Displays information on the alarms, warnings, etc. and their priority

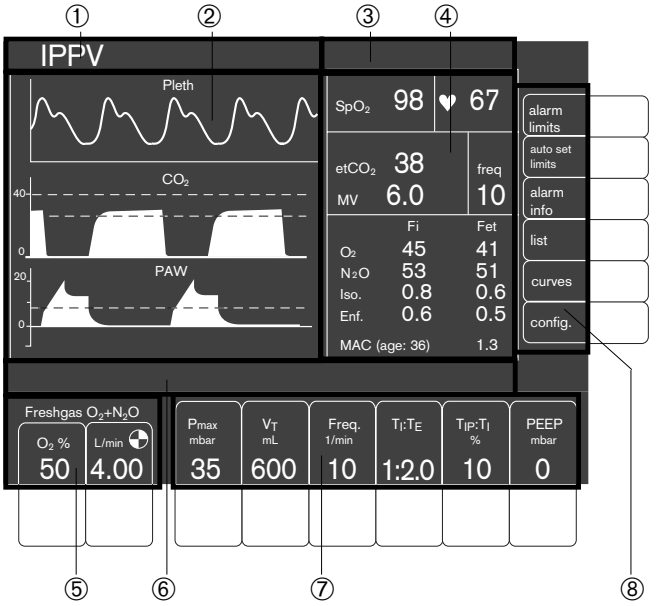
④ Numerical value field:
For numerical values

⑤ Lower softkeys – for fresh gas parameters

⑥ Prompt field:
For user guidance

⑦ Lower softkeys – for ventilation parameters

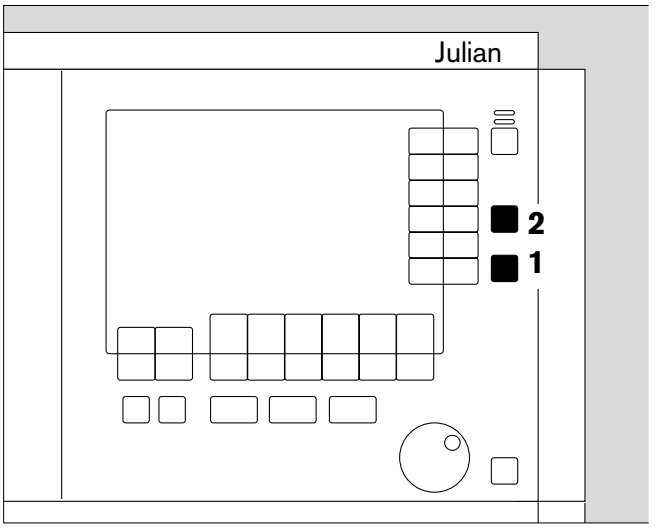
⑧ Right-hand softkeys – for monitoring:
For rapid selection of the desired monitoring function



Three basic screens for monitoring

To call up the **standard screen, data screen** and **trend screen** in succession:

1 Briefly press the key until the desired screen is displayed.



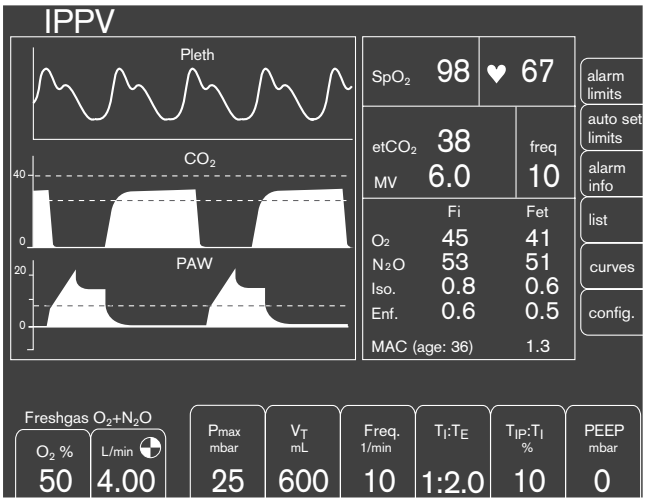
Back to the standard screen:

2 Press the key.

The fresh gas and ventilation parameters can be set by means of the softkeys in each of the three basic screens.

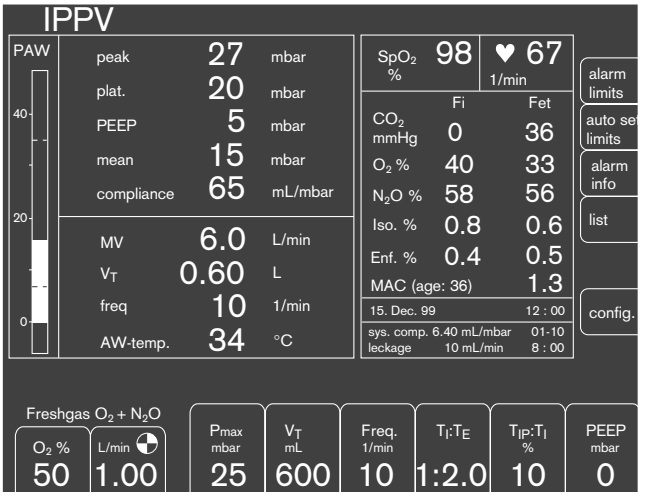
The standard screen

with three selectable curves.
The most important numerical values are displayed in groups on the right-hand side of the screen.



The data screen

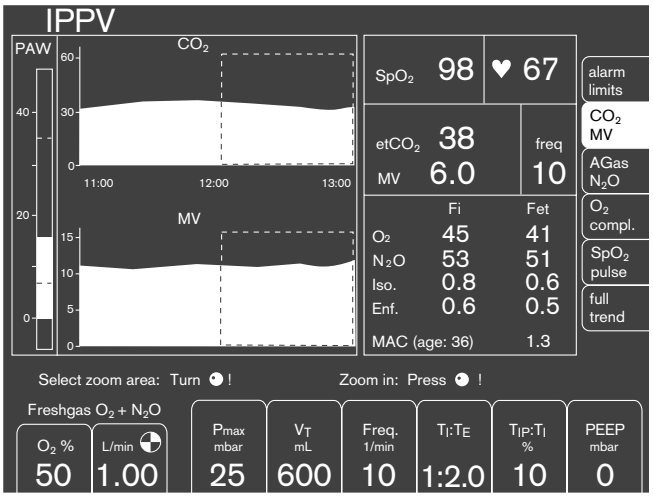
contains all the numerical values with their units of measure.



The trend screen
displays the recorded progress of the numerical values over time since measurement started. The current measured values are displayed on the right-hand side.

Display (example):

Trends for CO_2 and minute ventilation MV



Before Using for the First Time

Contents

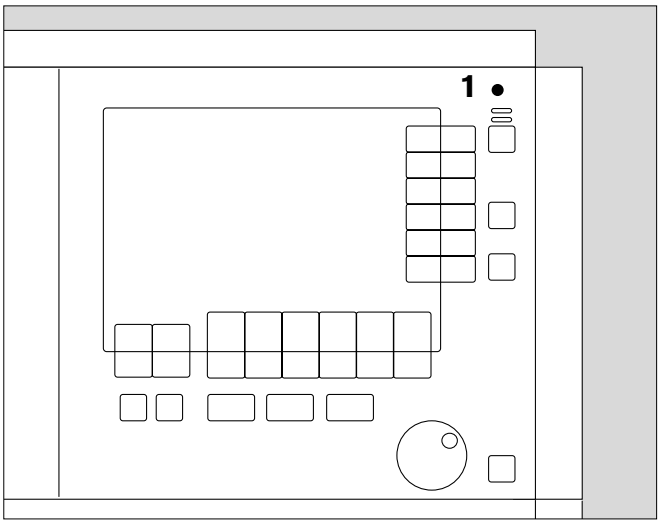
Before Using for the First Time

Fit the enclosed O_2 sensor,
page 119 "Replacing O_2 sensor"
Fit the flow sensor, page 108.

Charging the battery for emergency operation

Julian has a built-in uninterruptible power supply UPS which maintains the power supply for 30 minutes in the event of a mains failure, provided that the battery is charged.
The switch-over to the battery-powered UPS is automatic and is indicated on the screen by the message:
POWER FAIL!

The battery recharges automatically when the workstation is plugged into the mains.



The battery must be charged for 10 hours before using the Workstation for the first time.

- Plug the mains plug of the Julian workstation into the mains socket. The mains voltage must correspond to the voltage specified on the nameplate.

1 The green LED ⇉ lights up.

- Leave Julian connected to the mains for 10 hours. The workstation does not have to be switched on.

The devices connected to auxiliary power sockets will not be powered by the UPS in the event of a power failure.

When Julian is not in use

- **Charge battery at least every 4 weeks. Allowing it to run down can lead to damage.**

If Julian is out of use for an extended period:

- Leave the workstation connected to the mains at all times.

1 The green LED ⇉ is lit.

Preparation

Contents

Preparation

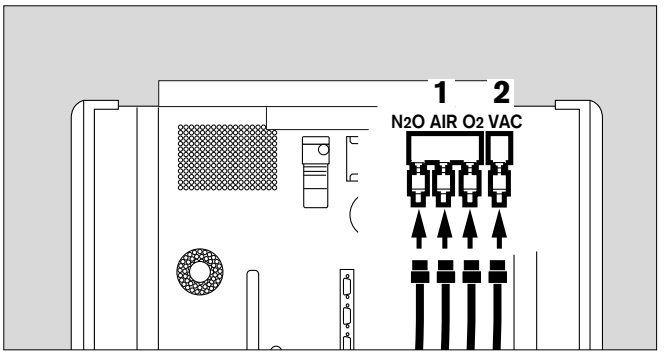
Use only cleaned and disinfected parts!

Connecting the gas supply

1 Screw the central gas supply pressure hoses for O_2, AIR and N_2O into the ports on the back of the gas supply block.
The two ports at the front are reserved for the backup gas cylinders.

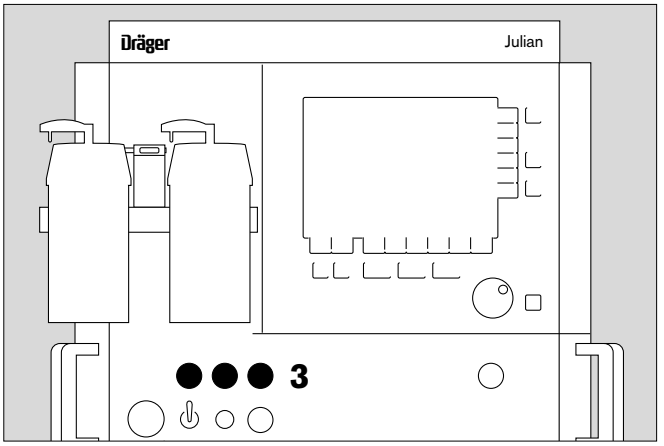
2 The vacuum supply block (VAC) is available as option for secretion aspiration.

Plug the other end of the pressure hoses into the wall supply points.



- Make sure the gas pressures of the central gas supply are between 2.7 and 5.5 bar:

3 All three pressure gauges in the green zone.



Connecting the backup gas cylinders for O_2 and N_2O

Even if the workstation is connected to a central gas supply, the cylinders must remain on the apparatus as backup supply.

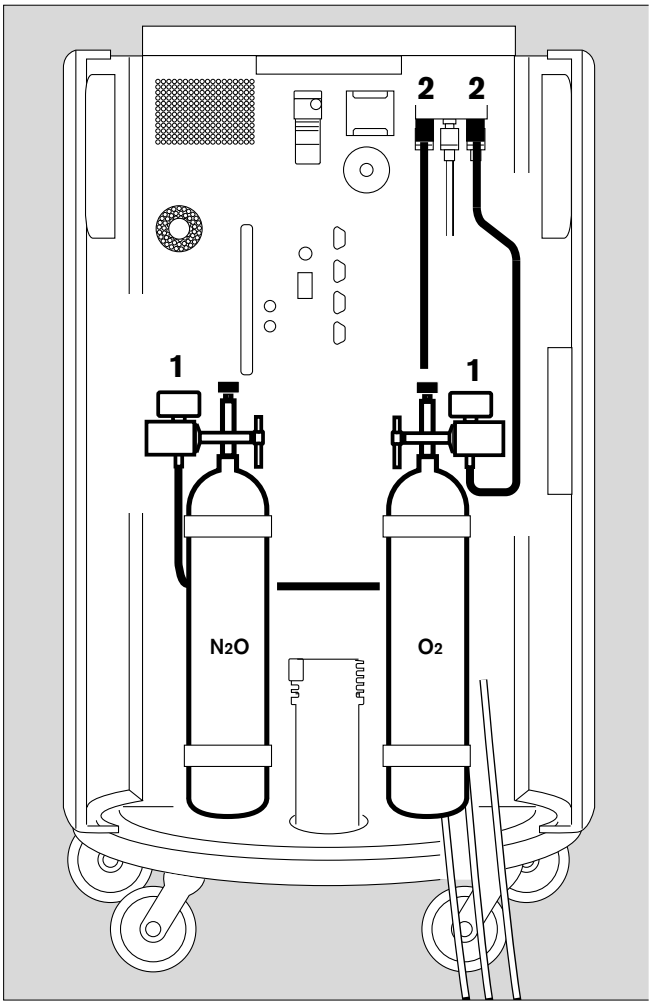
- On the back of the workstation:
  place full cylinders in the cylinder holders and secure in position.

1 Screw the pressure reducing adapters onto the cylinder valves.

2 Screw the gas hoses into the ports on the front of the gas supply block.

Switch over immediately to cylinder supply if the central gas supply fails:

- Open the cylinder valves.



Caution when handling O_2 cylinders

- Do not oil or grease the O_2 cylinder valves or O_2 pressure reducing adapters, and do not handle with greasy fingers.
  Danger of explosion!
- The cylinder valves must be opened / closed by hand. Do not use tools.
- If a cylinder valve is leaky or difficult to operate, it must be repaired by an expert.

Connecting the anaesthetic gas scavenging system

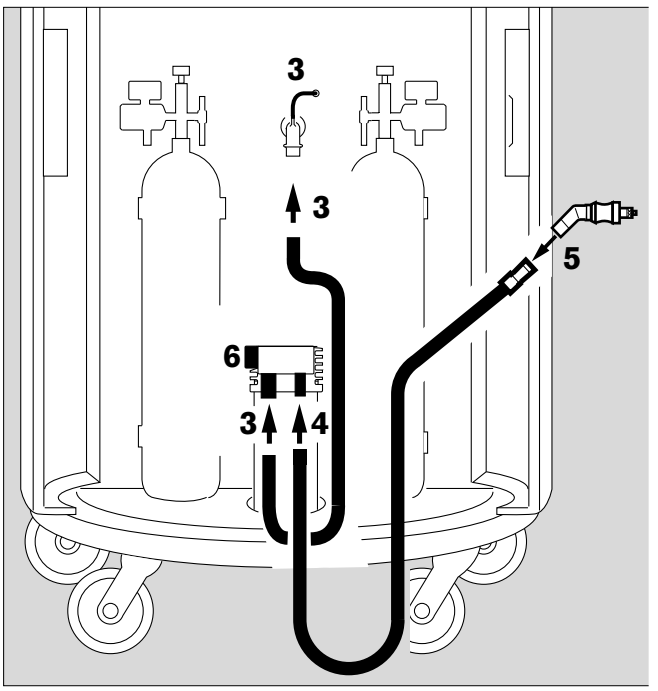
3 Connect the transfer hose to the waste gas port and to the port of the scavenging system.

4 Connect the scavenging hose to the port of the scavenging system.

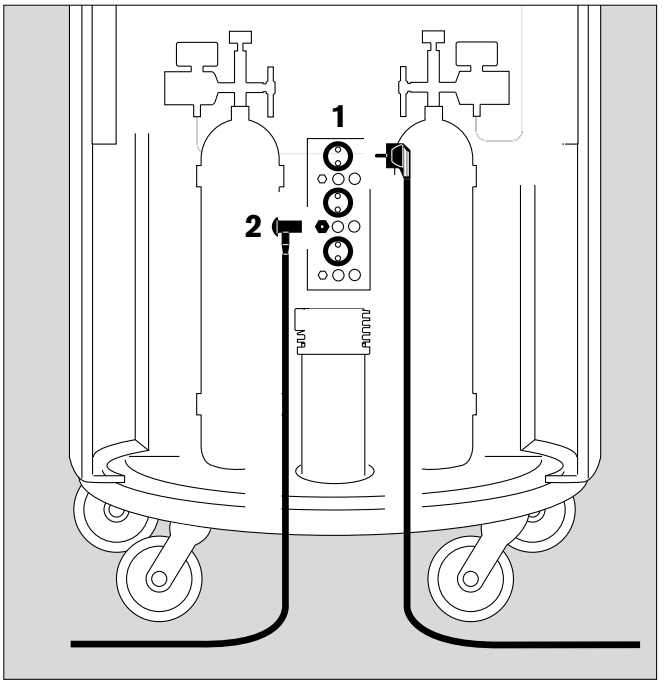
5 Connect the anaesthetic waste gas probe to the aspirating hose.

6 Ensure that the second connection to the scavenging system is sealed by a screw plug.

- Follow the Instructions for Use of the anaesthetic gas scavenging system.



Connecting the power supply



Connecting auxiliary systems

1 connect to auxiliary sockets on the back of the workstation.

The auxiliary sockets are not powered by the uninterruptible power supply UPS in the event of a power failure!

Do not connect HF surgical devices to the auxiliary sockets!
Connecting equipment to the auxiliary sockets may cause the patient leakage current to rise above the permitted values in the event of failure of a protective earth conductor.
The risk of electric shock cannot be excluded in such cases.
Additional power adapter sockets must not be connected to the auxiliary sockets.

Equipotential bonding

e.g. for intracardial or intracranial operations.

2 Connect one end of the earth cable to one of the connecting pins on the back of the workstation.

- Connect the other end of the earth cable to the specified equipotential bonding point, e.g. on the operating table or ceiling lamp.

Connecting the power supply

The mains voltage must be the same as specified on the nameplate on the back of the workstation.
Voltage range: 90 to 265 V

- Plug the mains plug into the wall socket.

Starting Up

Contents

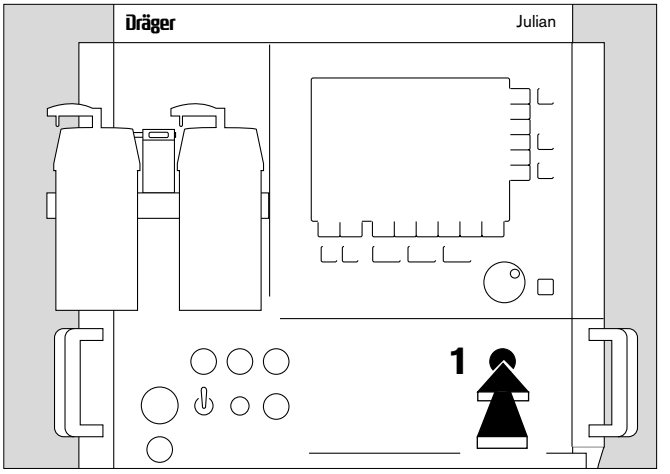
Starting Up

Checking the workstation against the checklist

Preconditions:
The workstation must be prepared as described on pages 97 to 107 and assembled ready for operation as described on pages 108 to 113.
The gas supply and power supply must be connected.

Switching on

1 Switch on Julian: press the power switch » ⏻ «.



Version without rotary knob for O_2 emergency metering:
After switching on, Julian delivers an O_2 flow of 8 L/min* for manual ventilation.
This O_2 flow is switched off automatically by Julian as soon as the »**cancel test**« key appears after acknowledging the checklist.

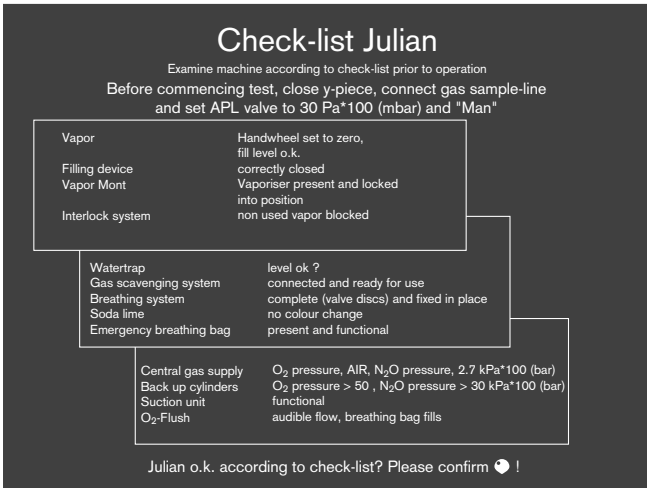
The opening screen appears with the current software version after about 10 seconds. Julian now loads its software and tests its internal memory.

The checklist is displayed after about 40 seconds.

- Check the components as instructed in the checklist on the screen.

If the self-test has to be interrupted, e.g. for a quick start in an emergency:

- Acknowledge the checklist:
  Press the rotary knob.
  After a few seconds, the »**cancel test**« softkey appears on the right-hand edge of the screen.
- Press the »**cancel test**« key. See "Emergency start" on page 33 to continue.

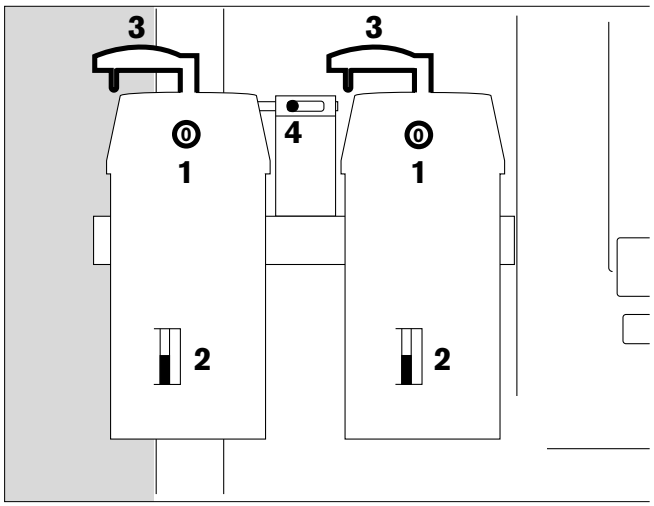


* Can be set to 4 L/min by DrägerService

"Vapor" anaesthetic vaporizer (example: Vapor 2000)

Only use Vapor 19.3, Vapor 2000 or Devapor. Follow the Instructions for Use for the particular vaporizer used.

The description and illustrations relate to Vapor 2000.



1 Handwheel to "0" and engaged.

2 Filled to sufficient level.

- The plug-in adapter must fit evenly on the connection block.

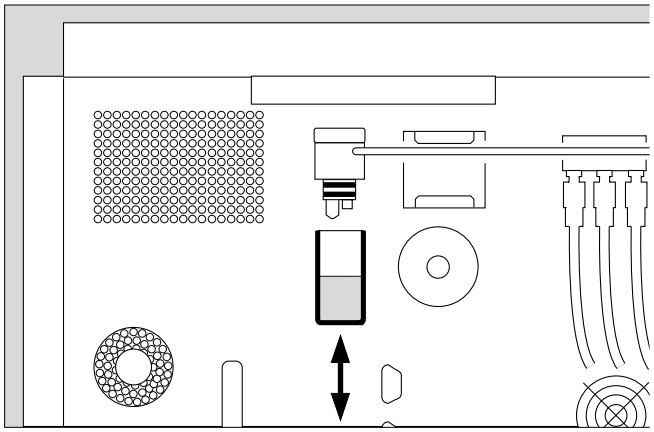
3 The locking lever must point to the left = locked.

4 The unused Vapor unit must be locked by the interlock slider (example: left-hand Vapor locked).

After filling or changing the Vapor:

- Carry out a leakage test, see page 48.

Water trap



- Remove water trap container by pulling downwards and empty if necessary.
- **Observe the hygiene regulations of the hospital.**
- Replace container from below.

When using the "Waterlock" water trap

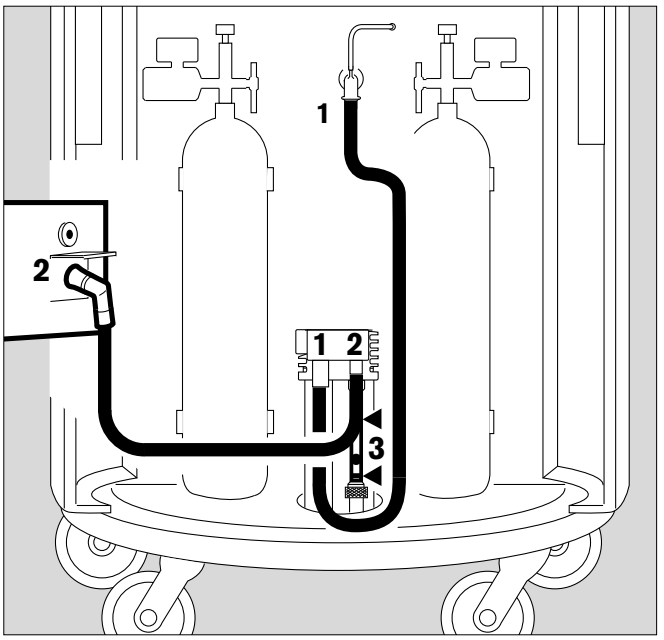
- See separate Instructions for Use

AGS anaesthetic gas scavenging system

1 The transfer hose from the waste gas port must be connected.

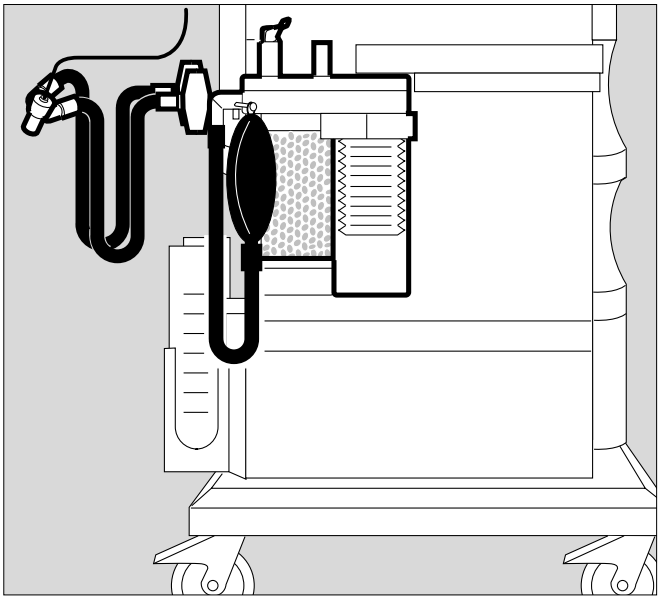
2 The scavenging hose must be connected; the anaesthetic waste gas probe must be plugged into the Dräger wall socket and the indicator must be green.

3 The float must be between the two marks.



Breathing system

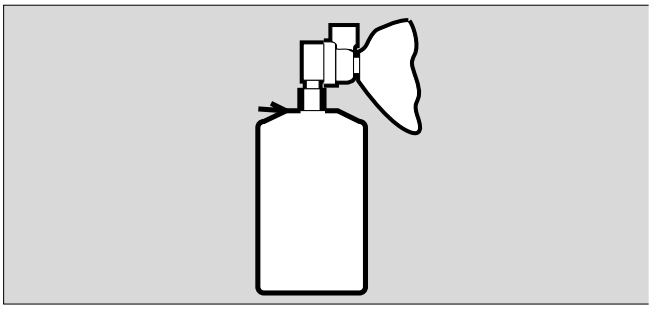
- Complete and engaged, with both valve discs inserted, bellows fitted and hoses securely connected.
- Soda lime renewed, **no violet discoloration.**



Emergency ventilating bag

Example: Dräger Resutator 2000

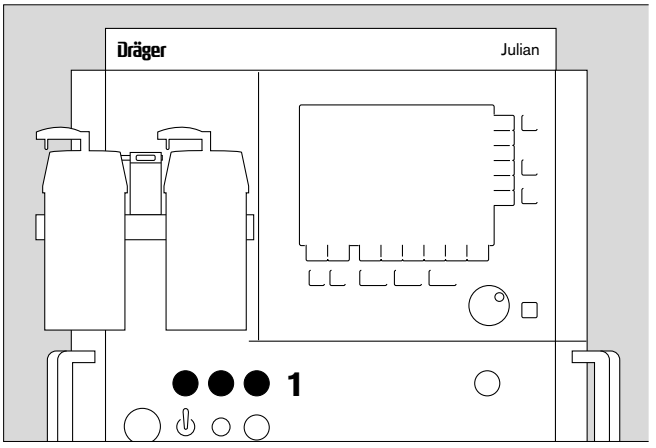
- Ready for operation.



Central gas supply

Gas pressures:

1 All pressure gauges in the green zone.



Backup gas cylinders

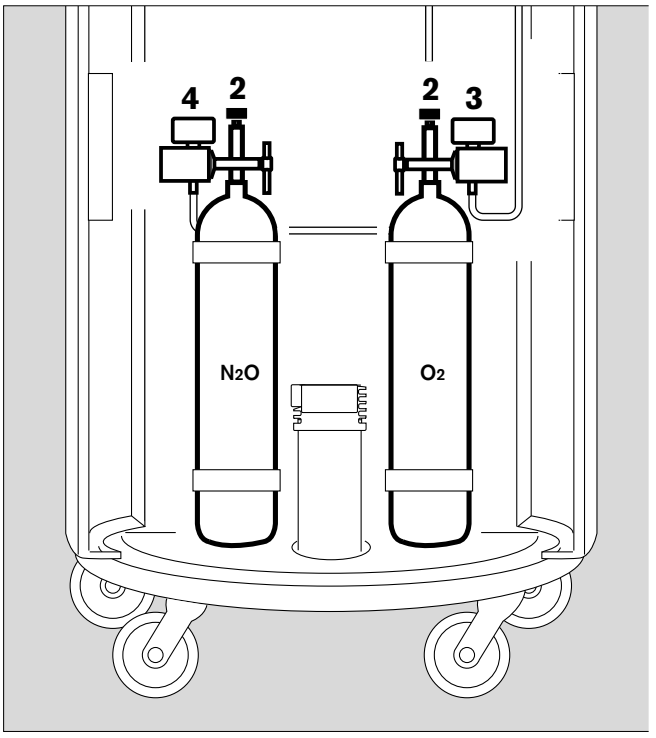
2 Slowly open the cylinder valves.

Check the cylinder pressure gauges:

3 O_2 pressure greater than 50 bar,

4 N_2O pressure greater than 30 bar.

2 Reclose the cylinder valves.



Suction system

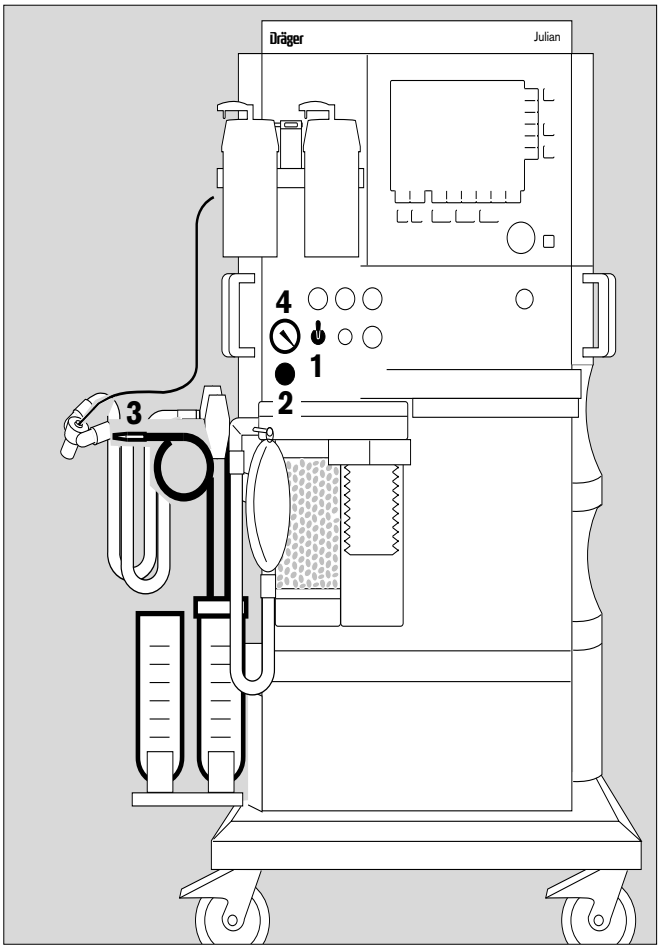
1 Switch to I.

2 Set suction pressure with rotary knob »**Vac.**«.

3 Block the secretion viewing window or kink the suction hose.

4 Measure the suction pressure on the pressure gauge.

1 Switch to 0.



O_2 flush

5 Press »**O_2 +**« button.

6 The breathing bag inflates.

7 O_2 flows from the Y-piece.

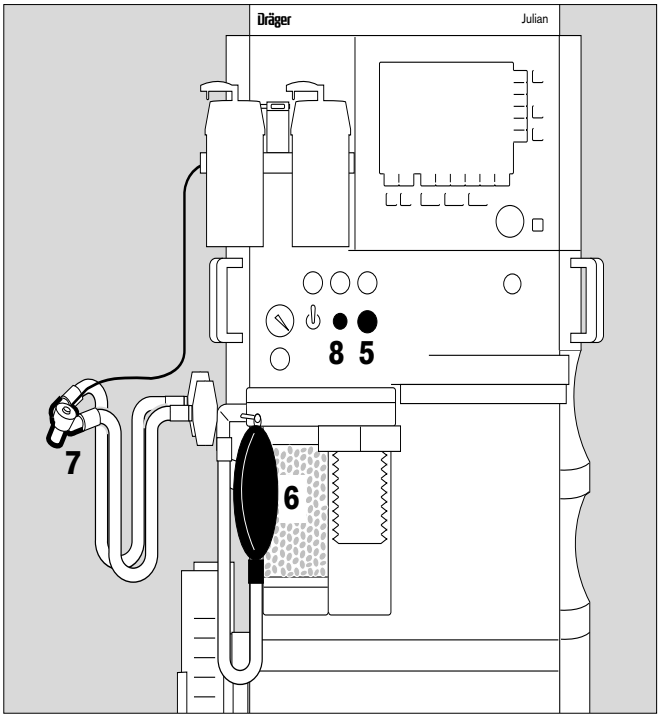
Version with rotary knob for O_2 emergency metering

8 Turn on rotary knob »**Safety O_2**« for O_2 emergency metering.

6 The breathing bag inflates.

7 O_2 flows from the Y-piece.

8 Turn off rotary knob »**Safety O_2**« for O_2 emergency metering again.

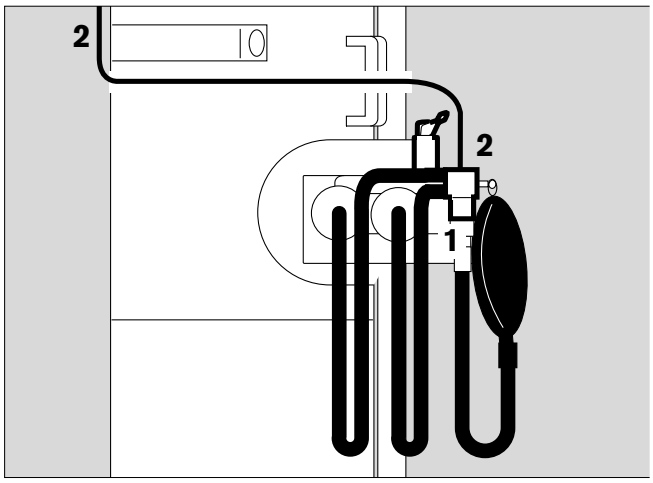


Preparing Julian for the self-test

- Make sure that the breathing system is securely connected.

1 Close the Y-piece = plug firmly on to the cone.

2 Ensure that the sample line is connected to the Y-piece and to the water trap on the back of the workstation.

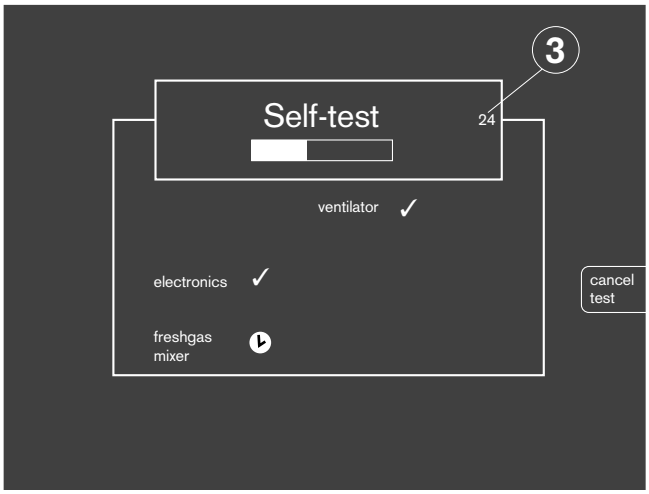


Self-test

If all points on the checklist are OK:

- Confirm = press the rotary knob.
  The self-test is started.
  The self-test is run automatically
  and takes 3 to 4 minutes.

3 Julian essentially carries out the following automatic tests and actions, which are coded:



Electronics

- Testing and calibration (Zeroing) of gas metering bench
- Testing and calibration of O_2 sensor
- Testing of pressure sensor for airway pressure measurement
- Testing the flow sensor
- Activating the default settings for alarm limits, monitoring parameters and the default settings of the ventilator and fresh gas settings

Fresh gas mixer

- Testing of gas supply O_2, N_2O, AIR
- Testing of gas inlet valves
- Testing of O_2 emergency metering
- Testing of fresh gas failure monitoring (optional)

Ventilator

- Testing and calibration of PEEP/Pmax valves
- Testing of safety valve
- Testing of MAN/AUTO switch-over valve
- Testing of breathing phase valve
- Testing of internal pressure sensor
- Determination of compliance and leakage

System compliance

Julian determines the current system compliance. Depending on the breathing hoses used, the system compliance is 5 to 6 mL/bar.

Leakage

Julian determines the current leakage of the breathing system and breathing hoses.
The system tolerates leaks of up to 150 mL/min.

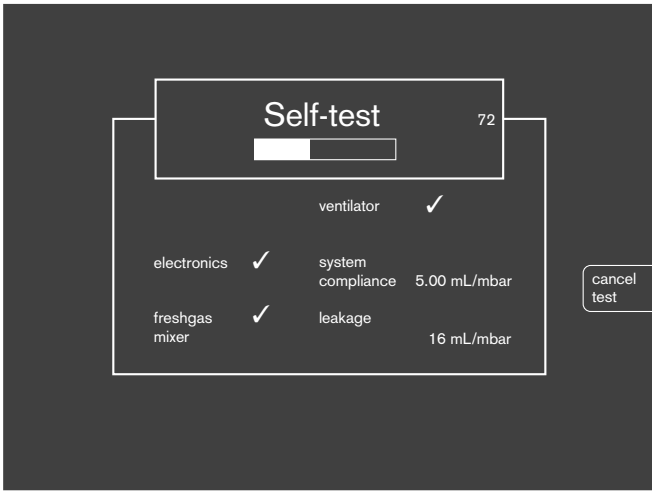
For leaks of more than 150 mL/min:

- Check the components of the breathing system, repair any leaks and repeat the leak test.

Possible causes of leaks include:

– damaged breathing hoses
– O2 sensor not connected, or incorrectly connected
– gas measurement sensor line not connected
– water trap not inserted
– breathing bag perforated
– Vapor not correctly connected / filling device open
– absorber not firmly screwed into place
– flow sensor not firmly screwed into place
– breathing system not correctly used
– microbe filter not firmly connected up
– measured gas return connection is open

Display (example):



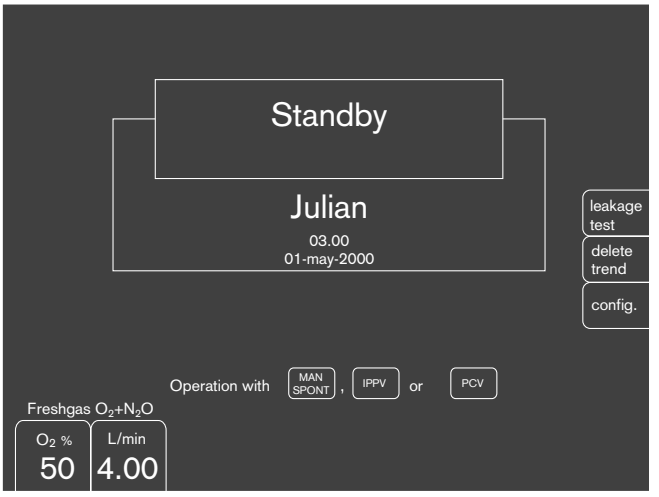
A tick (✓) indicates that the relevant test point has been completed successfully.
The clock symbol ʘ indicates the test stage is currently in progress.

Malfunctions detected in the self-test and any gas failures are displayed on the screen. Some malfunctions can be accepted by confirming = pressing the rotary knob, for example no AIR supply (AIR FAILURE!!!).
Other malfunctions need to be corrected before starting up the workstation, for example no O2 supply (O2 FAILURE!!!).

- The progress of the self-test is shown on the bar display.

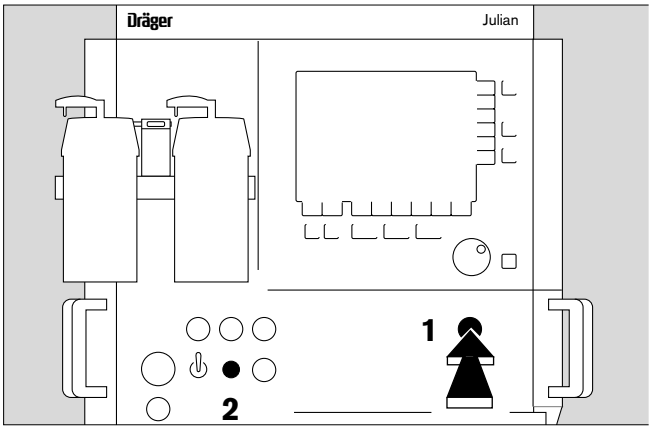
Julian switches to standby after the self-test.

Display:



Emergency start

This procedure should only be used when there is no time for the self-test!



1 Switch on the workstation.

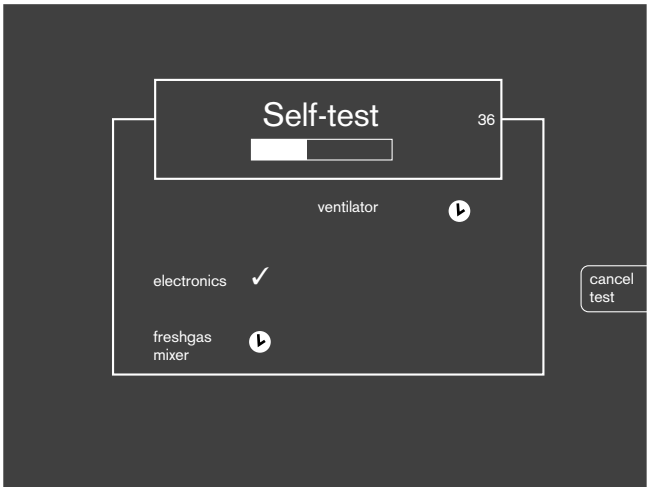
Version without rotary knob for O2 emergency metering:
After switching on, Julian delivers an O_2 flow of 8 L/min* for manual ventilation.

Version with rotary knob for O2 emergency metering:

2 Set rotary knob »**Safety-O_2**« for O_2 emergency metering to the desired O_2 flow.
Range 0 to 12 L/min.

- Wait for the software to be internally loaded and for the electronics to be self-tested.
  The checklist appears after about 40 seconds.
- Confirm the checklist: press the rotary knob.
  After a few seconds, the »**Cancel test**« softkey is displayed on the right-hand edge of the screen.

Display:



- Press the softkey »**Cancel test**«.

The apparatus only runs through a minimal test.

Julian is ready for operation about 1 minute after switching on. Calibration of the O_2 sensor is complete after about 2 minutes.

The leakage and compliance test is not performed. The accuracy levels specified in the "Technical Data" cannot be guaranteed.

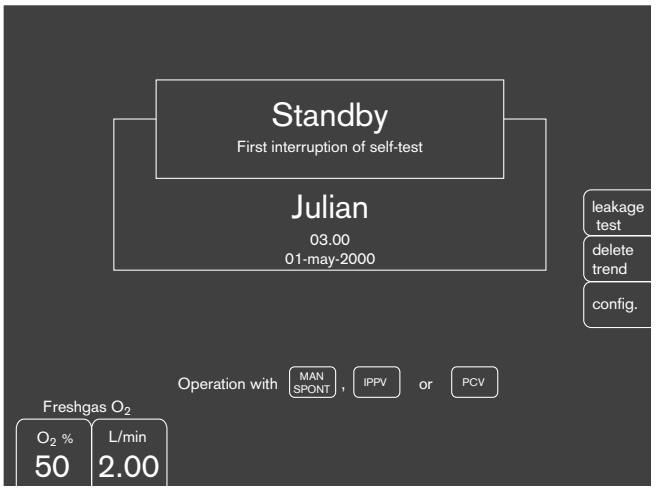
To prevent abuse of this facility, the self-test can only be cancelled 10 times in succession.
The self-test cannot be cancelled the next time that Julian is started and a complete self-test must be run through.**.

Cancelling a test can lead to malfunction.
- **Greater attention is required during operation of the workstation.**

* Can be set to 4 L/min by DrägerService
** Can be set to unlimited self-test cancellation by DrägerService

The workstation switches to standby mode after completing the minimal test.

Display (example):



If no key is pressed in standby mode for two minutes, the standby screen is switched off and a screen saver with the Dräger logo is displayed instead.

To switch the standby screen on again:

- Press the rotary knob or any other key.

To start Julian:

Version with rotary knob for O2 emergency metering:

- Turn rotary knob for O2 emergency metering to 0.

- Select fresh gas setting and ventilation mode.
  See »Operation«, page 36 onwards.

Operation

Contents

Operation

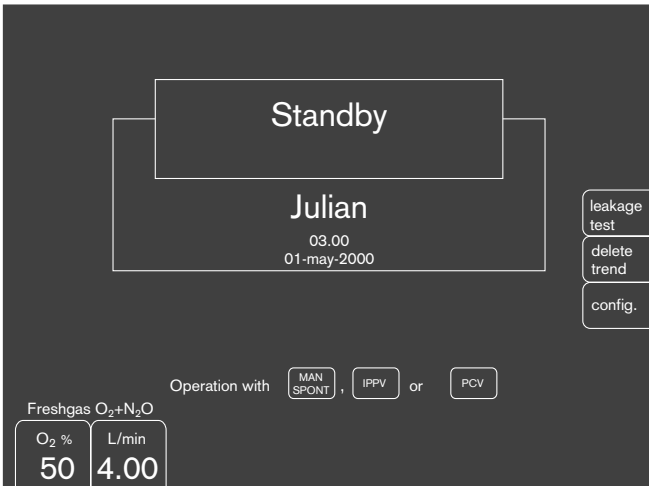
Setting the fresh gas concentrations

The fresh gas settings are displayed in the **Standby** screen:

– »**Fresh gas O_2 + N_2O**«
or
»**Fresh gas O_2 + AIR**«

– O_2 concentration »**O_2 %**«

– Fresh gas flow »**L/min**«



The settings correspond to the configurable default values after switching on and after entering standby mode. The fresh gas settings can be modified before selecting the ventilation mode.
Fresh gas does not flow in standby mode. The fresh gas flow is not enabled until a ventilation mode has been started.

Adjustment ranges and default settings on delivery

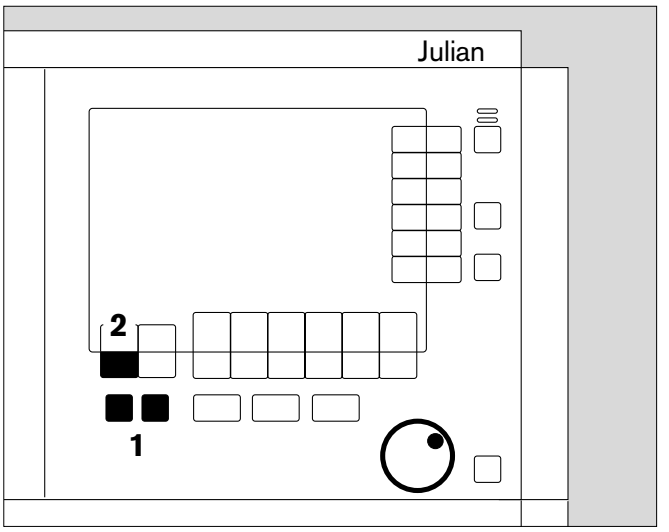
Fresh gas parameters	Adjustment range	Default setting on delivery
Carrier gas	AIR or N_2O	N_2O
O_2 %	25 to 100	100
Fresh gas flow L/min	0* ; 0,5 to 12	2

Selecting the carrier gas

1 Press the »**N_2O**« or »**AIR**« hardkey.
The yellow LED in the selected key flashes.

● Press the rotary knob to confirm. The yellow LED lights up constantly.

The selected fresh gas components are displayed on the screen.



Setting the O_2 concentration

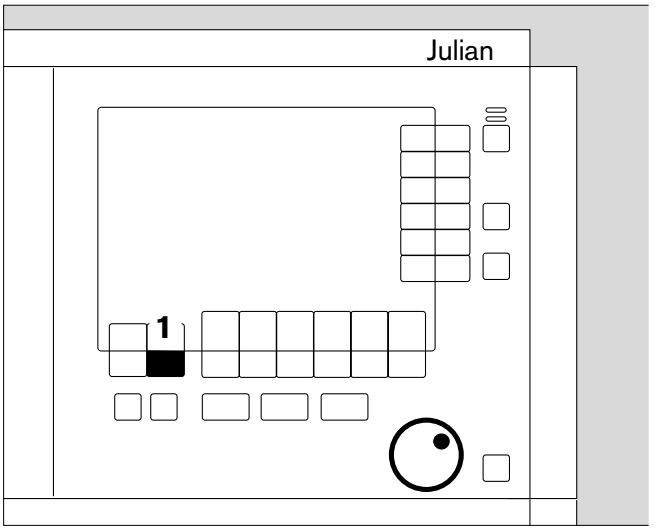
2 Press the softkey »**O_2%**«.

The key field is highlighted against a white background.

● Set and confirm the O_2 concentration by means of the rotary knob.

* Only in MAN/SPONT mode

Setting the fresh gas flow



1 Press the softkey »**L/min**«.

The key field appears dark against a light background.

- Set and confirm the fresh gas flow by means of the rotary knob.

Julian is fitted with an electronic O_2 minimum dosing system to avoid hypoxic gas mixtures. For fresh gas flow settings below 1 L/min, the O_2 concentration is automatically increased to a value corresponding to an O_2 flow of 250 mL/min. If this control system is activated, the O_2 value is highlighted in addition to the active softkey »**L/min**«.

Version with fresh gas failure detection (optional): During operation, Julian checks that the bellows are sufficiently full.

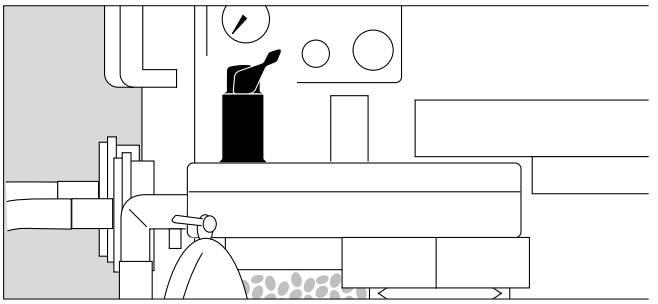
If the message „Fresh gas ? !!“ appears:

- Increase the fresh gas flow

The default settings valid whenever Julian is switched on can also be modified; see "Setting default values" on page 82.

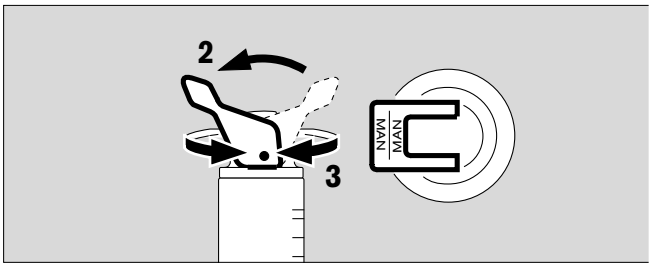
Selecting the ventilation mode

MAN/SPONT ventilation mode



Choose between manual ventilation **MAN** and spontaneous breathing **SPONT** on the APL pressure-limiting valve.

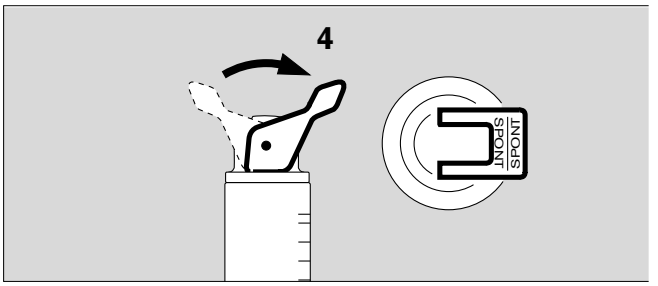
Manual ventilation



2 Set the lever of the APL pressure-limiting valve to **MAN.**

3 Set the pressure limit = rotate lever.

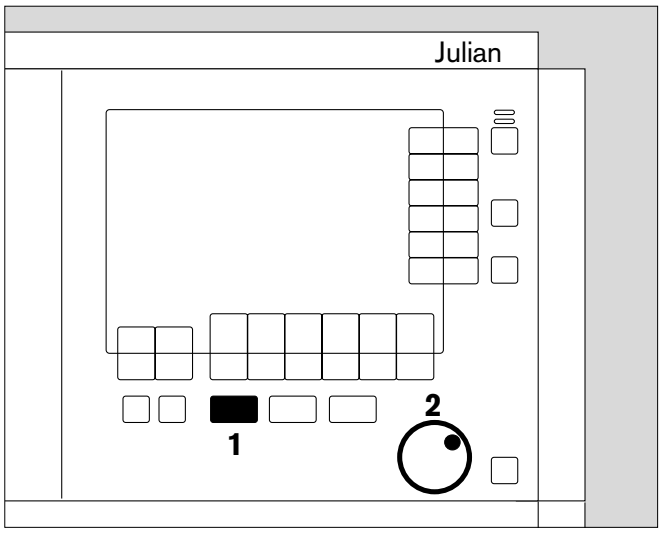
Spontaneous breathing



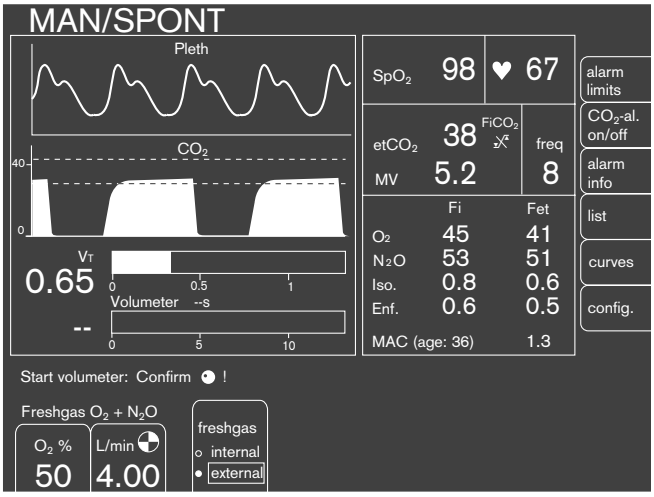
4 Set the lever of the APL pressure-limiting valve to **SPONT.**
The valve is open for a free spontaneous breathing stroke regardless of the set pressure limit.

1 Press the »**MAN/SPONT**« key,

2 and confirm with the rotary knob.



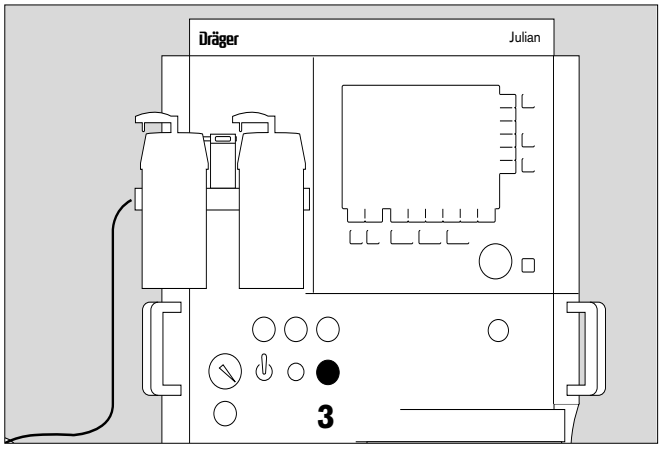
Display (example):



O2 flush

– For flushing and rapidly filling the breathing system and breathing bag with O2 while bypassing the Vapor unit.

3 Press the »**O2 +**« button.
O2 flows into the breathing system without anaesthetic gas as long as the button is held down.



Certain alarms are automatically switched off in MAN/SPONT ventilation mode in order to avoid artefacts. The deactivated alarms are identified by the grey background in the table.

Alarm limits	in MAN/SPONT mode	Default setting on delivery
SpO_2 ▼/▲	ON ON	– – 92
Pulse ♥ ▼/▲	ON ON	120 50
$etCO_2$ ▼/▲	* *	50 mmHg – –
$FiCO_2$ /▲	*	5 mmHg
MV ▼/▲	* *	– – – –
FiO_2 ▼/▲	* ON	– – 20
Fi Hal. ▼/▲	ON OFF	1.5 – –
Fi Iso. ▼/▲	ON OFF	2.3 – –
Fi Enf. ▼/▲	ON OFF	3.4 – –
Fi Des. ▼/▲	ON OFF	12.0 – –
Fi Sev. ▼/▲	ON OFF	3.4 – –
PAW ▼/▲	ON OFF	40 – –
Apnoea pressure	OFF	
Apnoea flow	OFF	
Apnoea CO_2	ON	activated after 60 seconds

– – : The default setting on delivery is outside the monitoring range and the corresponding alarm limit is switched off.

* The $etCO_2$ ▼/▲, $FiCO_2$ /▲, MV ▼/▲ and FiO_2 /▲ alarms can be configured »**ON**« or »**OFF**« in standby mode for the transition from MAN/SPONT. When the alarm limits are set to »**ON**«, the value is transferred from automatic ventilation mode.

To set the values of the alarm limits during operation see page 60.

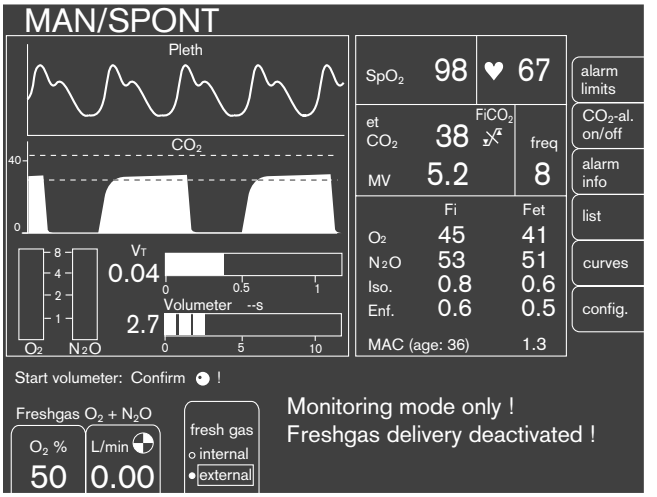
To set the default alarm limits see page 87.

Monitoring mode

Fresh gas delivery can be deactivated in MAN/SPONT ventilation mode.

- Set fresh gas flow to 0.00 L/min and confirm.
- An audible signal sounds and Julian is now in monitoring mode.

Display (example):



IPPV ventilation mode

IPPV = **I**ntermittent **P**ositive **P**ressure **V**entilation
Volume-controlled ventilation with fixed mandatory minute volume (MV), set with the tidal volume (V_T), breathing rate (Freq.) and the ratio of inspiration time to expiration (T_I:T_E).

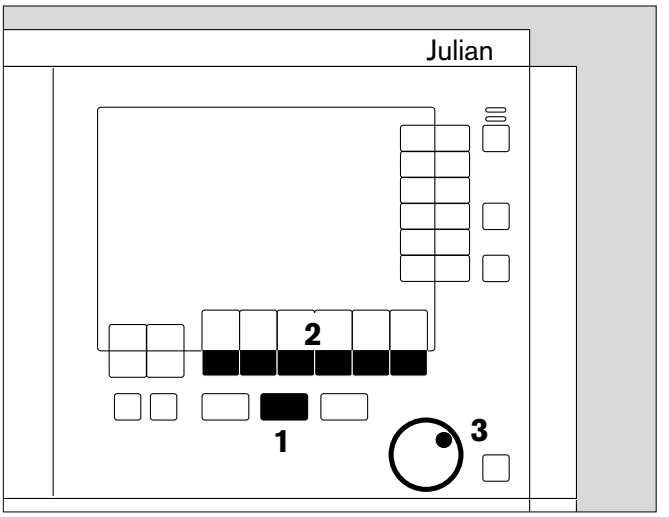
Presetting the ventilation parameters for IPPV

1 Press the »**IPPV**« hardkey; its LED flashes.

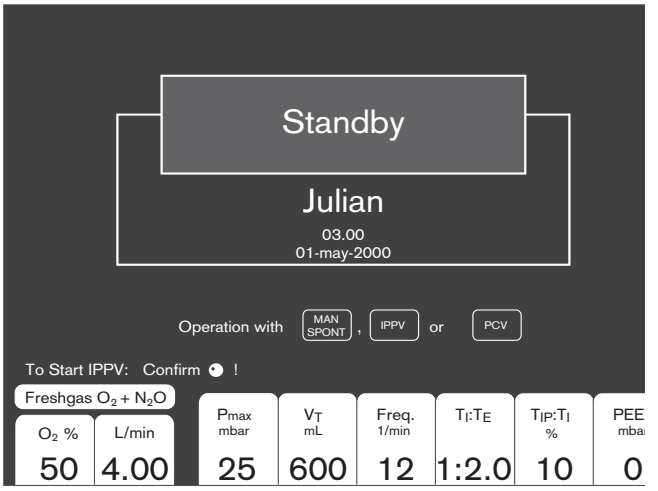
- The six ventilation parameters for IPPV are displayed on the screen with their default settings.

2 Press the softkey for the desired ventilation parameter.

3 Set and confirm the ventilation parameter with the rotary knob.



Display (example):



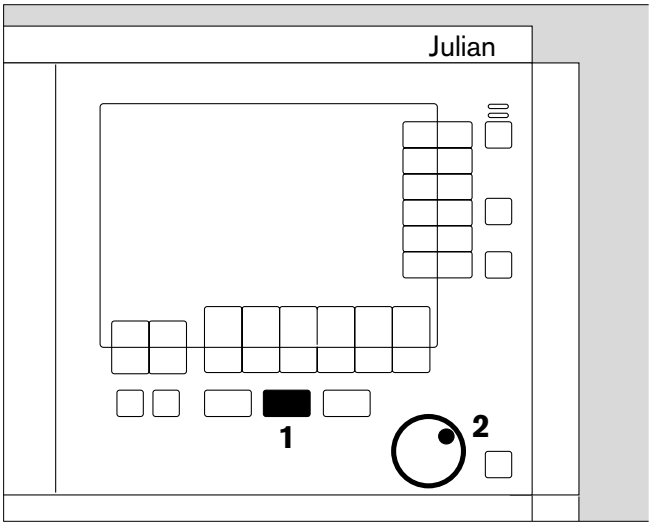
Adjustment ranges and default settings on delivery

Ventilation parameters	Adjustment range	Default setting on delivery*
Pressure limit Pmax [mbar]	10 to 70	25
Tidal volume V_T [mL]	50 to 1400	600
Frequency Freq. [1/min]	6 to 60	12
Insp/Exp ratio $T_I : T_E$	2.0:1 to 1:2.0 in increments of 0.1, 1:2.0 to 1:4.0, in increments of 0.5	1 : 2.0
Insp. pause time : Insp. time $T_{IP} : T_I$ [%]	0 to 50	10
PEEP [mbar]	0 to 20	0

For tidal volumes V_T of less than 200 mL:

- Use the paediatric hose set, see "Ventilating children", page 49.

In IPPV ventilation mode, automatic system compliance compensation takes place, and the applied tidal volume therefore corresponds to the set volume.

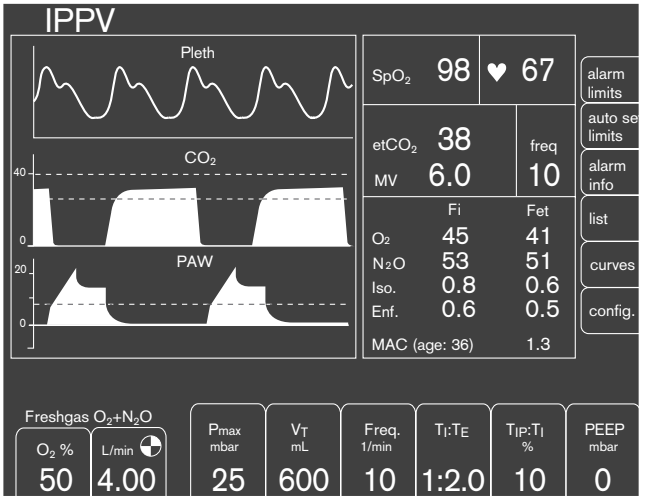


Starting IPPV

1 Press the »**IPPV**« hardkey

2 and confirm with the rotary knob.

Display (example):



The preset ventilation parameters are displayed on the screen.

The symbol ⊕ rotates in the softkey »L/min« to indicate that fresh gas is flowing.

If a change in ventilation parameters is required:

- Press the corresponding softkey. Set and confirm the ventilation parameter with the rotary knob.

* The default values can be set specifically for each hospital, see page 82.

Alarms effective in IPPV mode

Alarm limits	In IPPV mode	Default setting on delivery
SpO_2	ON ON	– – 92
Pulse ♥	ON ON	120 50
$etCO_2$	ON ON	50 mmHg – –
$FiCO_2$	ON	5 mmHg
MV	ON ON	– – 3.0
FiO_2	ON ON	– – 20
Fi Hal.	ON ON	1.5 – –
Fi Iso.	ON ON	2.3 – –
Fi Enf.	ON ON	3.4 – –
Fi Des.	ON ON	12.0 – –
Fi Sev.	ON ON	3.4 – –
PAW	ON ON	40 8
Apnoea pressure	ON	Active after 15 seconds
Apnoea flow	ON	Active after 15 seconds
Apnoea CO_2	ON	Active after 15 seconds

– – : The default setting on delivery is outside the monitoring range and the corresponding alarm limit is switched off.

To set the values of the alarm limits during operation see page 60.

To set the default alarm limits see page 87.

PCV ventilation mode

PCV = **P**ressure **C**ontrolled **V**entilation

In pressure controlled ventilation mode, the applied tidal volume depends on the ventilation parameters Pmax, insp. Flow, insp. Time, PEEP and the lung compliance. Changes in ventilation parameters or lung compliance influence the tidal volume and the MV minute volume must therefore be monitored constantly.

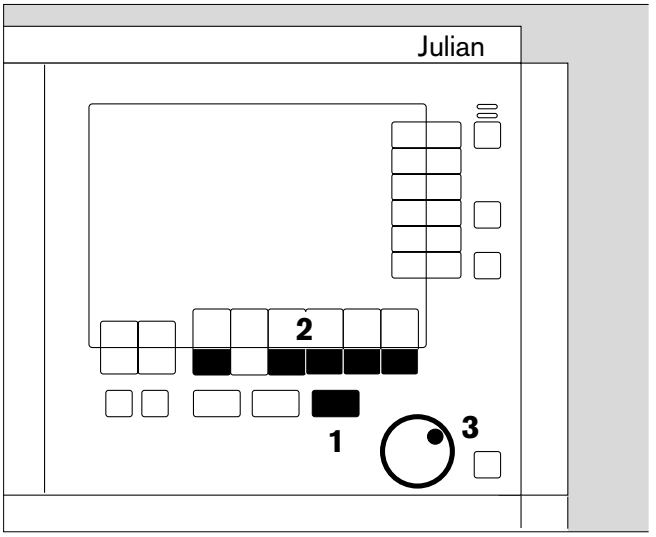
Presetting ventilation parameters for PCV

1 Press »**PCV**« its LED flashes.

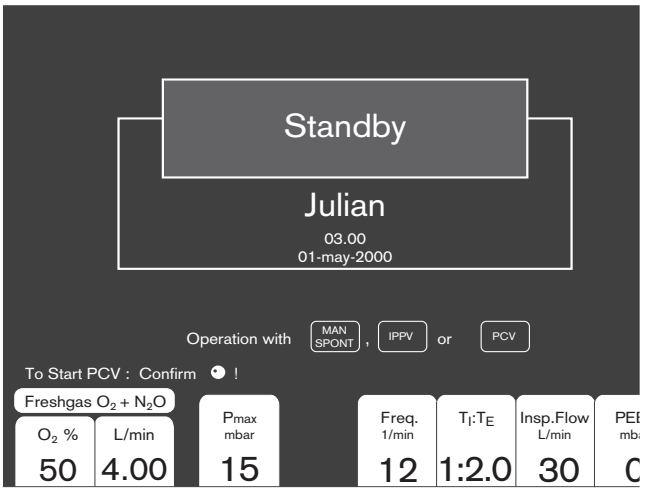
- The five ventilation parameters for PCV appear on the screen with the default settings.

2 Press the softkey of the relevant ventilation parameter.

3 Set and confirm the ventilation parameter with the rotary knob.



Display (example):



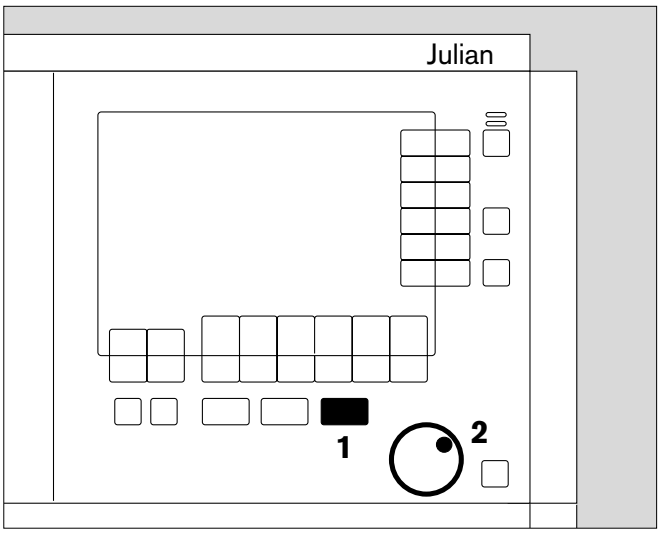
Adjustment ranges and default settings on delivery*

Ventilation parameter	Adjustment range	Default setting on delivery
Pressure limit Pmax [mbar]	(PEEP+1) to 70	15
Frequency Freq. [1/min]	6 to 60	12
Insp./Exp. ratio TI : TE	2.0:1 to 1:2.0 in increments of 0.1, 1:2.0 to 1:4.0, in increments of 0.5	1 : 2.0
Insp. flow [L/min]	5 to 50 (75**)	30
PEEP [mbar]	0 to 20	0

When ventilating infants weighing less than 20 kg:

- Use the paediatric hose set;
see page 49 "Ventilating children".

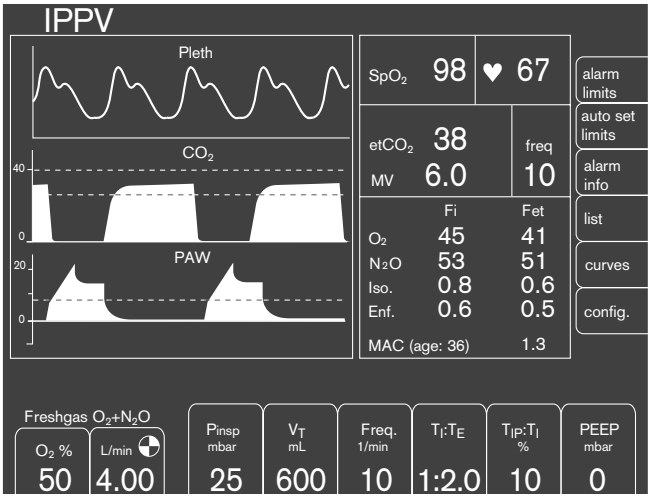
Starting PCV



1 Press »**PCV**«.

2 Confirm by pressing the rotary knob.

Display (example):



The preset ventilation parameters appear on the screen.

Fresh gas flows, as indicated by the rotating symbol in the softkey »L/min«.

If a change in ventilation parameters is required:

- Press the relevant softkey. Set and confirm the ventilation parameter with the rotary knob.

* The default settings can be set specifically for each hospital, see page 82.

** Can be set by DrägerService.

Alarms effective in PCV mode

Alarm limits	In PCV mode	Default setting on delivery
SpO_2	ON ON	– – 92
Pulse ♥	ON ON	120 50
$etCO_2$	ON ON	50 mmHg – –
$FiCO_2$	ON	5 mmHg
MV	ON ON	– – 3.0
FiO_2	ON ON	– – 20
Fi Hal.	ON ON	1.5 – –
Fi Iso.	ON ON	2.3 – –
Fi Enf.	ON ON	3.4 – –
Fi Des.	ON ON	12.0 – –
Fi Sev.	ON ON	3.4 – –
PAW	ON ON	40 8
Apnoea pressure	ON	Active after 15 seconds
Apnoea flow	ON	Active after 15 seconds
Apnoea CO_2	ON	Active after 15 seconds

– – : The default setting on delivery is outside the monitoring range and the corresponding alarm limit is switched off.

To set the values of the alarm limits during operation see page 60.

To set the default alarm limits see page 87.

Setting the Vapor unit

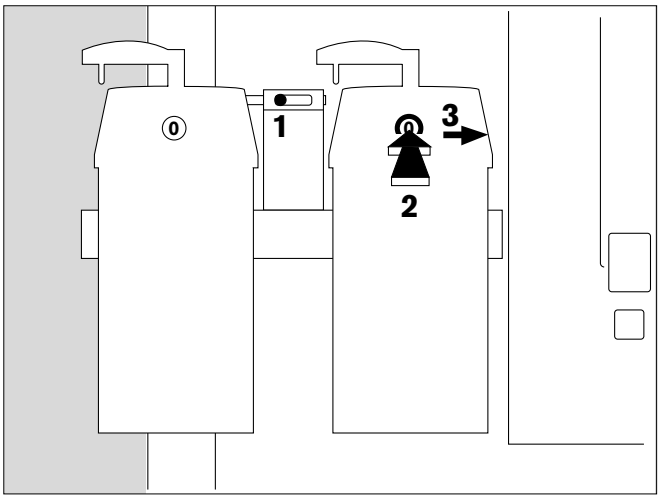
1 Lock the unused Vapor unit
= push lever fully in the direction of the unused Vapor (example: left-hand Vapor locked).

If the handwheel is in the »T« position:

2 Press 0 button and engage handwheel at 0.
Wait 5 seconds for pressure compensation.

2 Press 0 button and

3 Turn handwheel anti-clockwise to required anaesthetic agent concentration.



Aspirating secretion

- Swing the bottles forwards.

1 Set the switch to I.

2 Seal the "fingertip" or kink the suction hose and

3 Set the appropriate suction pressure for the patient with the rotary knob »**Vac**.« and

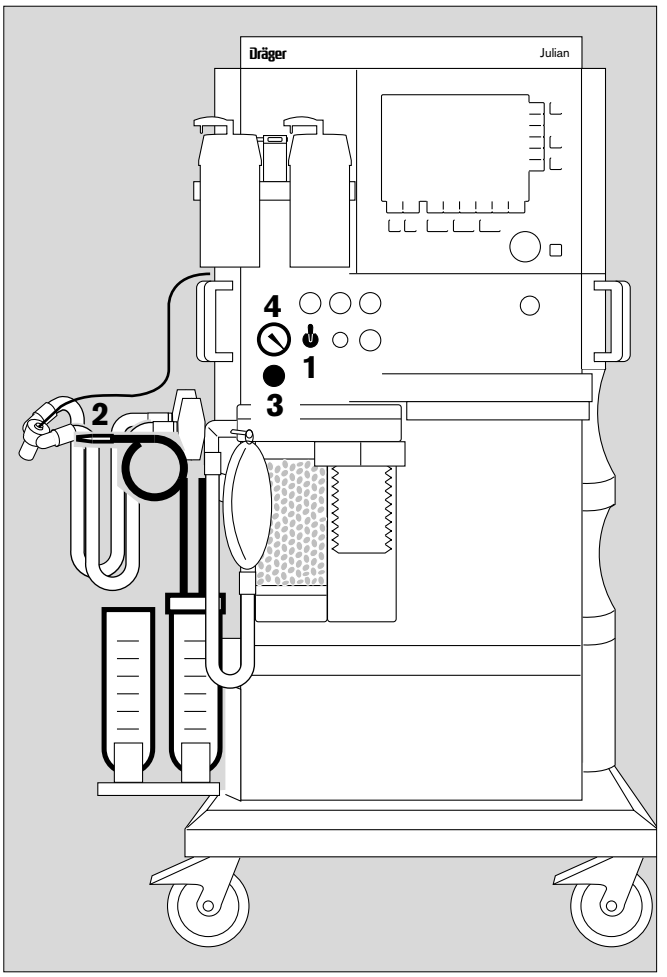
4 check on the pressure gauge.

Observe the hygiene regulations of the hospital!

After aspirating

- Rinse the suction hose with the water purifier.

1 Set the switch to 0.



Changing patients

To switch Julian to standby:

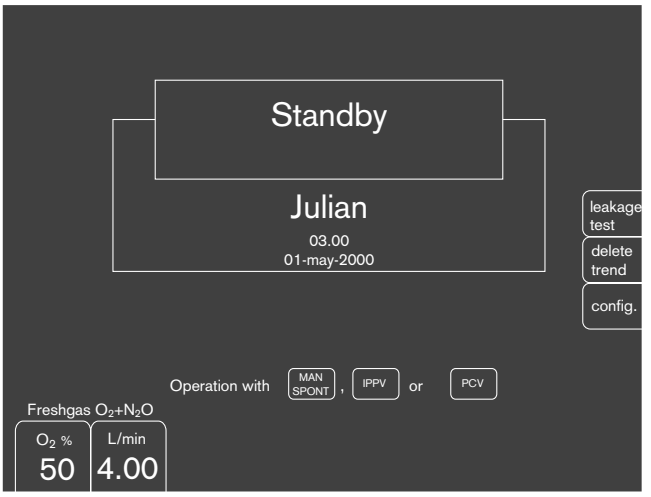
- Press the Standby key and confirm with the rotary knob.

The functions of the workstation are switched off.
The set alarm limits are cancelled and the default alarm settings are valid again.

The default settings are loaded for dosing anaesthetic gas and for the ventilation parameters.

If the ventilation hoses have been changed:

- Perform a leakage test, page 48.



Changing soda lime

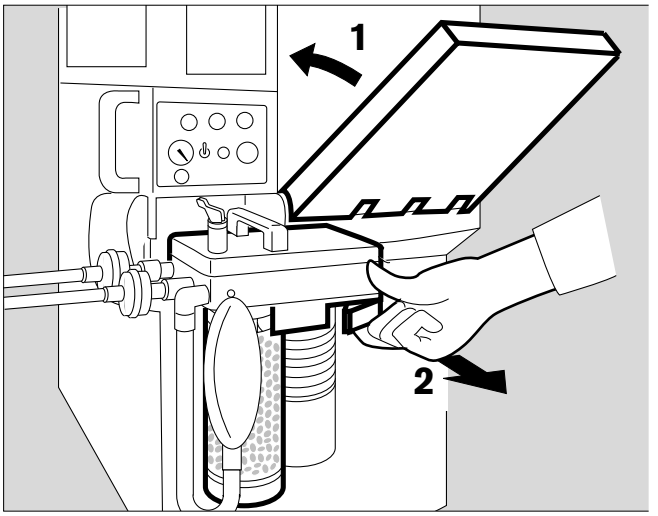
– If the soda lime in the absorber has turned violet.

– If the inspiratory CO_2 concentration $FiCO_2$ equals 5 mmHg or more.

- Press the Standby key and confirm by pressing the rotary knob.

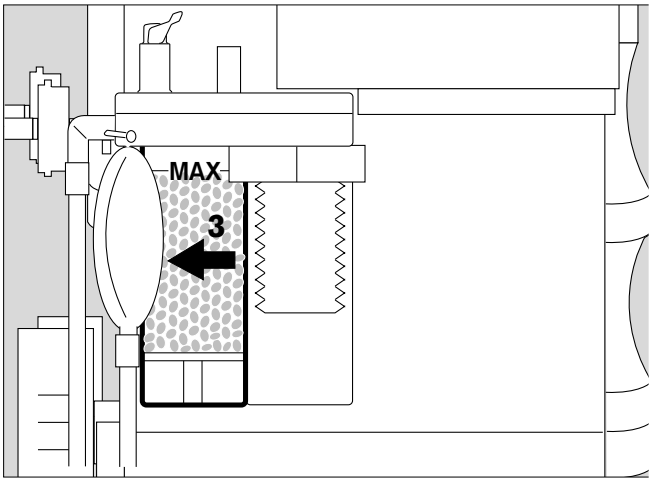
1 Raise the writing top.

2 Pull the catch and draw out the breathing system at the same time.



3 Turn the absorber counterclockwise and pull it out downwards.

- Drain the used soda lime and dispose of with domestic waste.
- Fill the absorber with fresh soda lime up to the MAX mark.
- Fit the absorber to the breathing system from below and turn it clockwise as far as it will go.
- Push the breathing system inwards until it clicks into place.
- Fold down the writing top.



Leakage test

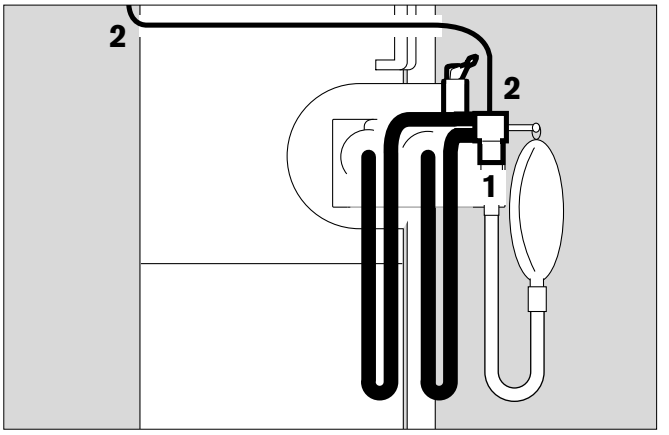
Must not be performed when a patient is connected to the workstation!

– When the soda lime has been changed
or
– when the breathing hoses have been changed.
– if the Vapor has been changed or topped up.

- test with the handwheel set to »0« and
- test with the handwheel set to less than 0.2% by vol.
- After the leakage test, turn handwheel to »0«.

1 Close the Y-piece = place firmly on the cone.

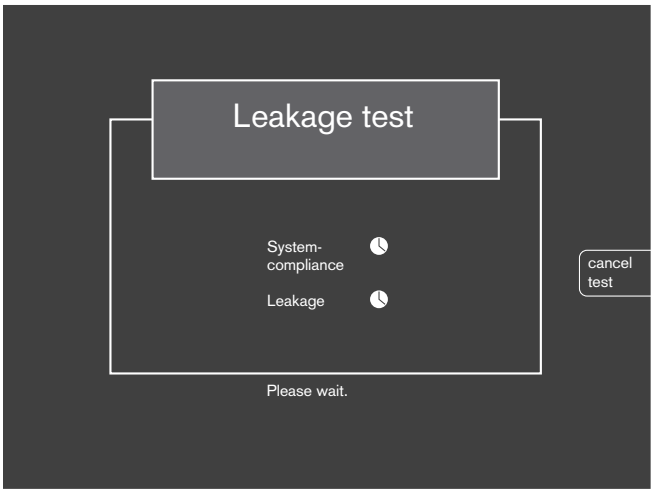
2 Ensure that the sample line is connected to the Y-piece and to the water trap at the back of the workstation.



- Press the softkey »**leakage**« in standby mode.

Julian performs the leakage test for IPPV/PCV and determines the volume correction for system compliance. Duration approx. 30 seconds.
The breathing bag and its hose are not included in the test.

Display:



After the test has been successfully completed, the clock symbol disappears and Julian displays the values for leakage and system compliance for a few seconds.
The results of the leakage test are continually displayed on the data screen.

To return to the standby screen:

- Press the rotary knob.

Ventilating children

For tidal volumes VT of less than 200 mL:

- Use paediatric hoses.

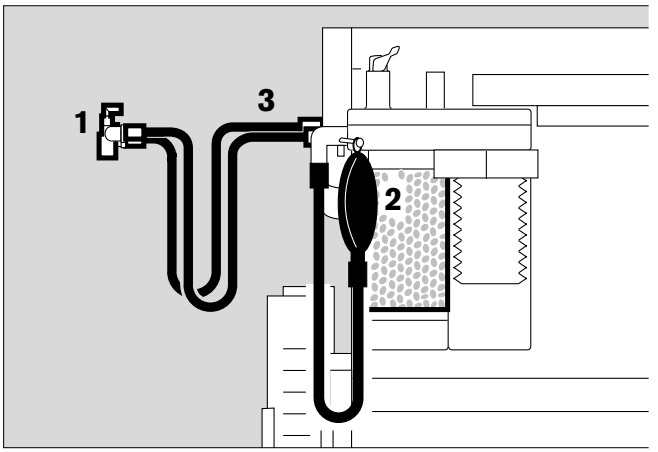
Connecting the breathing hoses

1 Use Y-piece with connection for sample line.

- The inspiratory and expiratory microbial filter 654 St should not be used – this reduces the system compliance.

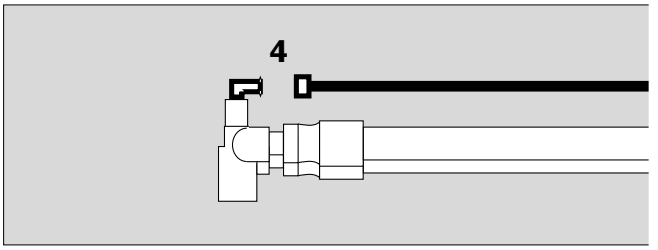
2 Connect 0.5 L breathing bag with socket to the breathing hose with the large connection sleeves. Slip the breathing hose over the angled socket. Hang the 0.5 L breathing bag onto the hook.

3 Slip the breathing hoses with the large sleeves onto the inspiratory and expiratory sockets and connect the small sleeves to the Y-piece.



4 Connect the sample line to the Y-piece and water trap.

- Set the sample rate to 200 mL/min, page 84.



If the measured gas is not recirculated:

- Increase the tidal volume VT in accordance with the sample rate.

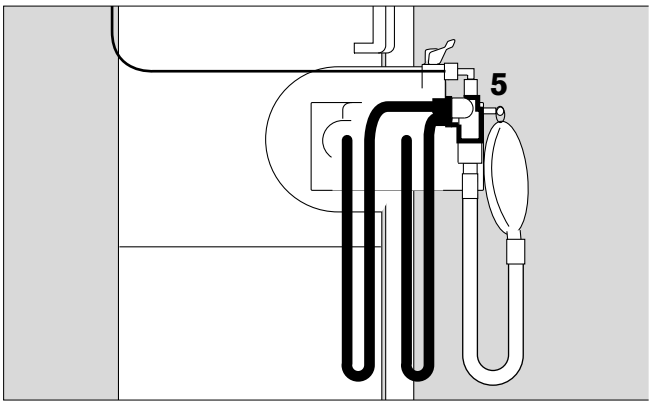
Volumeter function:

- Select »Child« scale, page 67.

To determine system compliance and leakage:

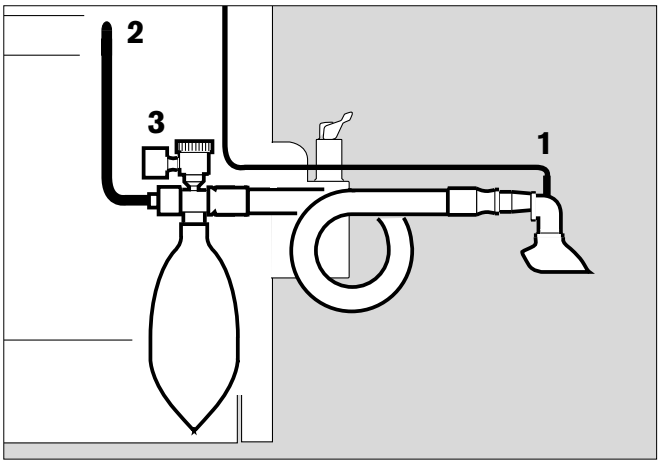
5 Firmly connect the Y-piece to the cone.

- Determine the system compliance and leakage, see „Leakage test“ on page 48. Set a correspondingly higher tidal volume VT in accordance with the airway pressure PAW.
- Use PCV or IPPV ventilation mode.



Using non-rebreathing systems

Example: Bain system



- Prepare the Bain system in accordance with the separate Instructions for Use.
- Remove sample line from Y-piece, as otherwise Julian activates a **PAW NEGATIVE** alarm.

For the specified monitoring of O_2, CO_2 and anaesthetic agents:

1 Screw the sample line to the Luer lock connection of the mask manifold pipe and to the water trap on the back of the workstation.

For mask pipes without sample line connector:

- Place a T-piece with filter between the mask pipe and fresh gas connection port.

or:

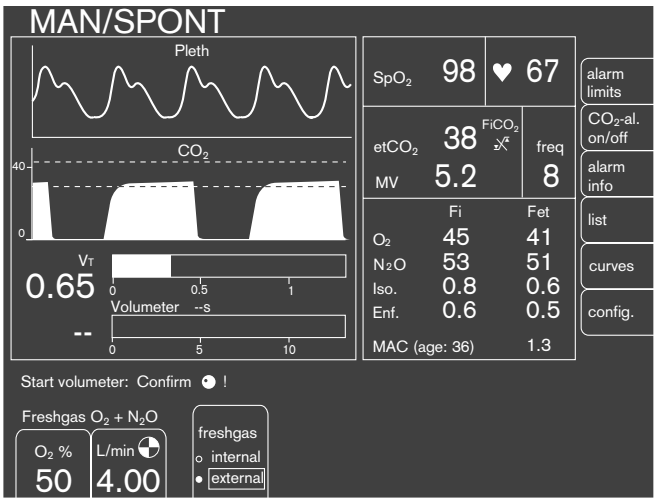
- where applicable, use the Luer lock connection of a filter.

2 Connect the fresh gas hose of the Bain system to the fresh gas outlet.

3 Connect the anaesthetic gas scavenging system AGS to the Bain system.

- Note the Instructions for Use of the Bain system.

Display (example):



In **MAN/SPONT** ventilation mode:

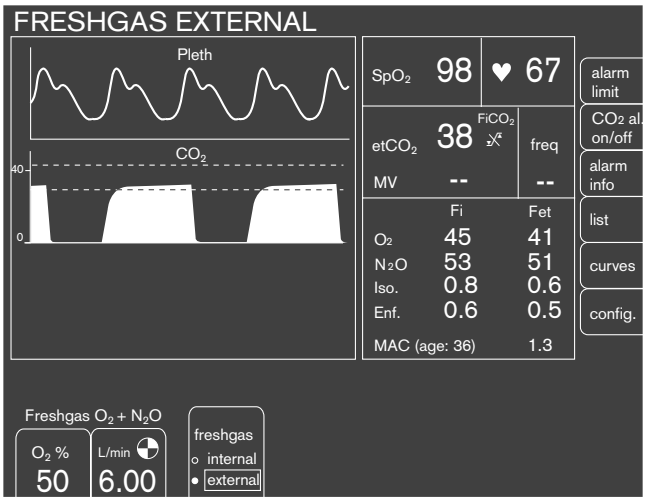
- Press the softkey »**Fresh gas internal / external**«, select »**Fresh gas external**« and confirm by pressing the rotary knob.

Display (example):

The airway pressure (PAW), minute volume (MV) and frequency are not measured.

- Set the fresh gas flow. The fresh gas supply must be at least twice the minute volume in order to prevent rebreathing.

Certain alarms are automatically switched off in order to avoid artefacts.
The inactive alarm limits are highlighted by the grey background in the following table.



Alarm limits	In external fresh gas mode	Default setting on delivery
SpO2	ON ON	– – 92
Pulse ♥	ON ON	120 50
etCO2	* *	50 mmHg – –
FiCO2	*	– –
MV	OFF OFF	– – – –
FiO2	* ON	– – 20
Fi Hal.	ON OFF	1,5 – –
Fi Iso.	ON OFF	2,3 – –
Fi Enf.	ON OFF	3,4 – –
Fi Des.	ON OFF	12,0 – –
Fi Sev.	ON OFF	3,4 – –
PAW	ON OFF	40 – –
Apnoe Druck	OFF	
Apnoe Volumen	OFF	
Apnoe CO2	ON	

* The etCO2, FiCO2 and FiO2 alarms can be configured »**ON**« or »**OFF**« in standby mode for the transition from MAN/SPONT. When the alarm limits are set to »**ON**«, the value is transferred from automatic ventilation mode.

Switch off the external fresh gas output:

- Press the softkey »**Fresh gas internal / external**«, select »**Fresh gas internal**« and confirm by pressing the rotary knob:

  Julian switches over to **MAN/SPONT** ventilation mode

  or

- Press the »**IPPV**« or »**PCV**« key and confirm with the rotary knob.

Julian then switches over directly to controlled ventilation via the original rebreathing system.

When changing from the external non-rebreathing system to the rebreathing system of the Julian:

- Reconnect the sample line to the Y-piece.

In the event of a power failure

Julian automatically switches over to the integrated uninterruptible power supply (UPS).
If the battery is charged, operation will be maintained for an average of 30 minutes.

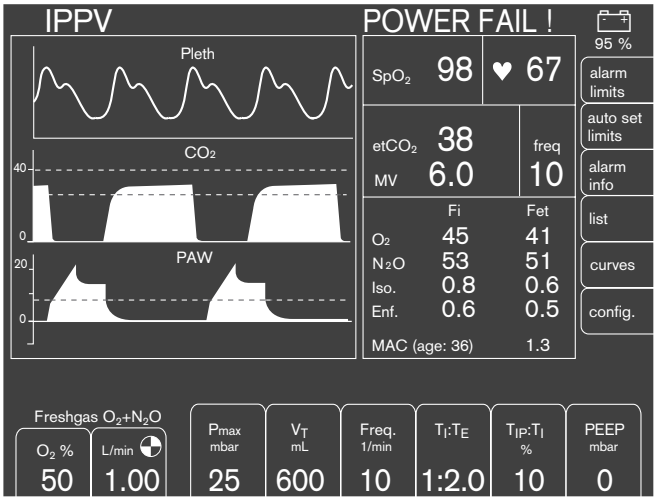
The message

POWER FAIL!

appears on the screen

together with the remaining available battery capacity in percent.
Example:

95 %



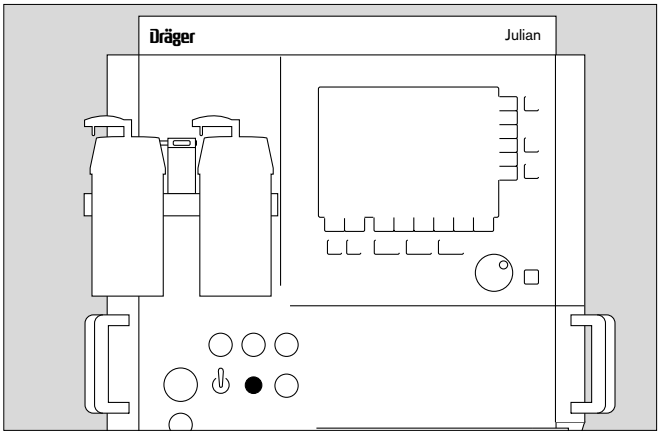
If the battery is almost completely discharged, the message **BATTERY LOW !!!** appears on the screen.

In the event of a power failure if the battery is discharged, Julian switches over automatically to **MAN/SPONT** ventilation mode. The fresh gas mixer is deactivated.

Version without rotary knob for O2 emergency metering:
Julian automatically delivers an O2 flow of 8 L/min*.
This O2 flow bypasses the Vapor unit, and so the patient no longer receives any anaesthetic agent.

Version with rotary knob for O2 emergency metering:

- Set rotary knob »**Safety-O2**« for O2 emergency metering to the desired O2 flow.
  Range 0 to 12 L/min.
  This O2 flow flows through the Vapor unit.
- Check Vapor unit setting.
- **Ventilate patient manually!**



* Can be set to 4 L/min by DrägerService

In the event of a gas failure

Julian activates an alarm if the O_2 or AIR or N_2O supply fails.

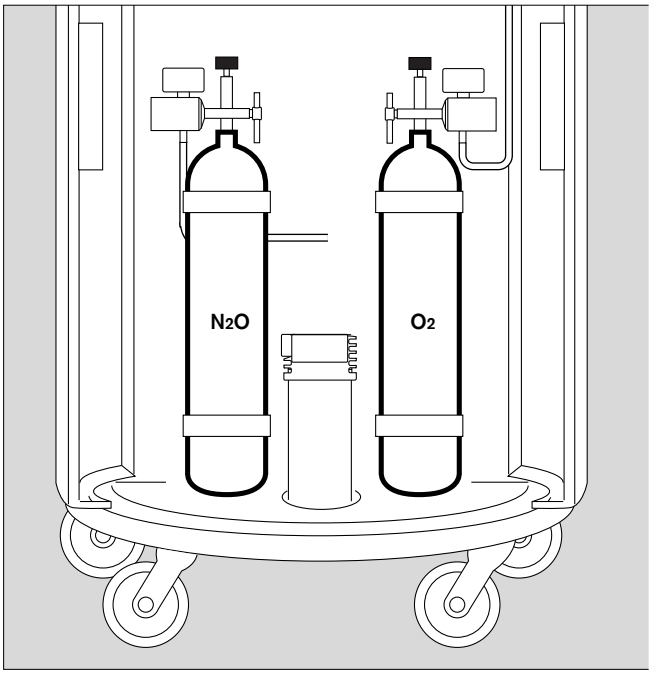
- Open the valve on the corresponding backup gas cylinder on the rear of the workstation.
- Reconnect the central gas supply.

If there is no backup supply of gas available, Julian replaces the set gas mixture with AIR or O_2:

Julian delivers 100 % AIR if the O_2 supply fails.
Julian delivers 100 % O_2 if the N_2O supply fails.
Julian delivers 100 % O_2 if the AIR supply fails.

The amount of fresh gas flow (L/min) remains constant.

Fresh gas metering is still possible even in the event of failure of one of the gases. For example, if the N_2O supply fails, AIR can be selected as the carrier gas.

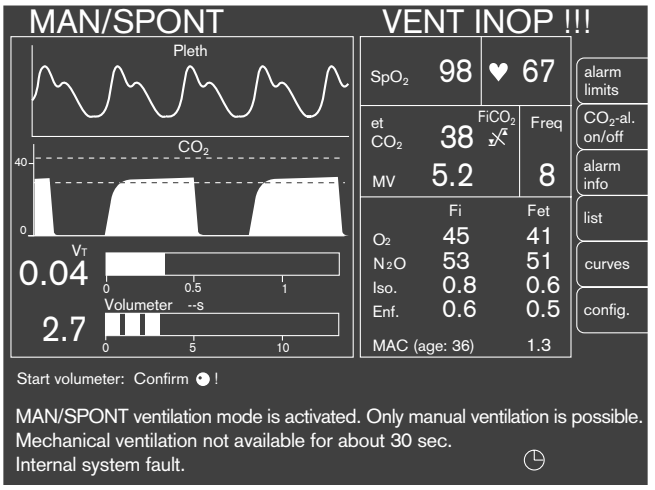


System fault

such as implausible measured values, the message:
VENT INOP!!!
will be displayed.

Julian first performs a warm start.

Display (example):



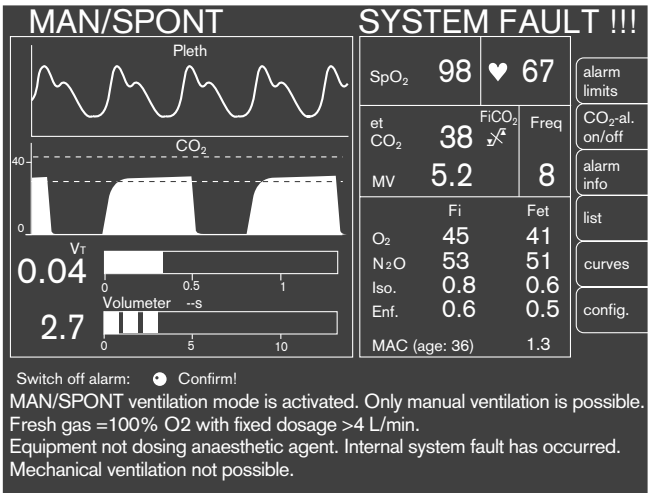
If the warm start is successful, Julian returns to the previous ventilation mode.

If the warm start is unsuccessful, Julian behaves as described under "In the event of a major hardware fault".

In the event of a Major Hardware Fault

such as the failure of the fresh gas mixer, the message:
SYSTEM FAULT!!!
will be displayed.

Display (example):



The audio alarm can be switched off by acknowledging via the rotary knob.

In the event of total system failure including the screen, an alarm will sound for about 30 seconds.
In such cases Julian switches to **MAN/SPONT** ventilation mode.

Version without rotary knob for O_2 emergency metering:
Julian automatically delivers an O_2 flow of 8 L/min*.
This O_2 flow bypasses the Vapor unit, and so the patient no longer receives any anaesthetic agent.

Version with rotary knob for O_2 emergency metering:

- Set rotary knob for O_2 emergency metering to the desired O_2 flow.
  Range 0 to 12 L/min.
  This O_2 flow flows through the Vapor unit.
- Check the Vapor unit setting.
- **Ventilate the patient manually!**

End of Operation

To switch Julian to Standby:

- Press the standby key ⏻ and confirm by pressing the rotary knob.
  The workstation is now on standby.
  The fresh gas flow is switched off.
  Manual ventilation is not possible!

The following default values are activated in standby mode:
Fresh gas default values
Ventilation parameters
Alarm limits

To switch Julian off:

- Press the power switch » ■○ ⊙▬ « down completely.

Julian is fitted with a switch-off delay. When the power switch is pressed, an audible signal sounds and the message
"**System can be switched on again without loss of data. System is being closed down and switched off**"
appears for 10 seconds.
Within this 10-second period Julian can be restarted immediately by pressing the power switch again.
The switch-off delay is not active during the self-test.

- Remove the gas supply probes from the wall sockets.
- Leave Julian plugged into the power supply in order to charge the uninterruptible power supply (UPS).
- In case of mains power supply failure, the power switch should always be switched off. Starting up the workstation with the power switch on and the UPS discharged leads to emergency dosage.

To switch off the anaesthetic gas scavenging system AGS:

- Pull back the black sleeve on the connector of the suction hose to release the connector.

* Can be set to 4 L/min by DrägerService

Monitoring

Contents

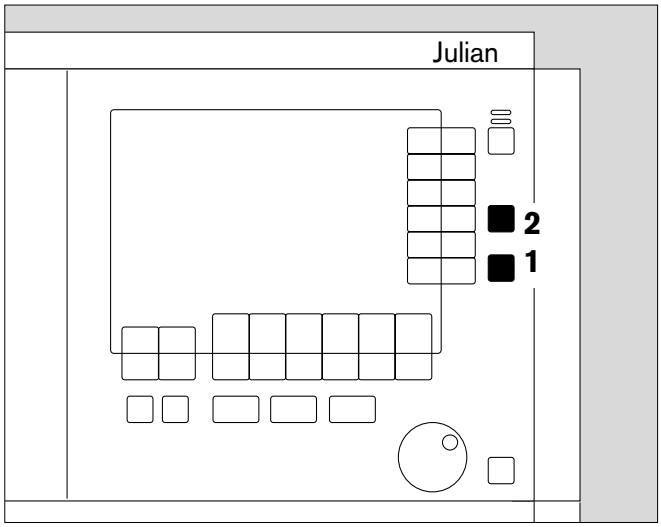
Monitoring

Selecting the standard screen

The standard screen is automatically displayed on the screen whenever a ventilation mode is selected (MAN/SPONT or IPPV or PCV). This page can always be selected during operation:

1 Press the key
or

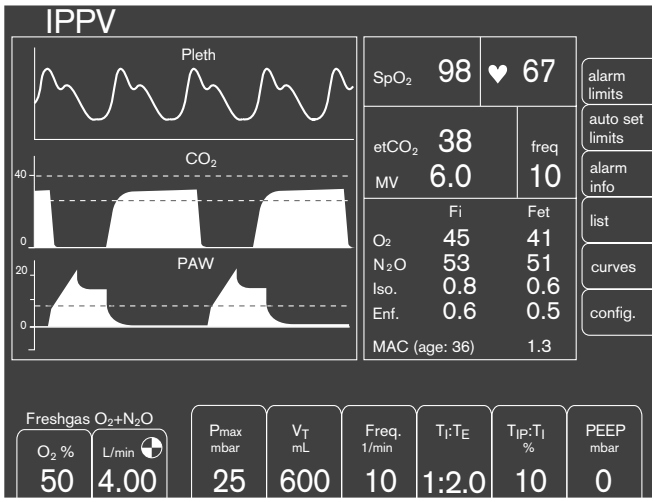
2 Press the key several times.



Display (example):

The most important parameters are grouped together on the right-hand side of the screen.

Three curves are displayed on the left-hand side (to select other curves, see page 66).



Measured values shown in grey

Calibration is performed automatically by Julian. The measured values are shown in grey until sufficient data are available and until the sensors have reached their operating temperature.
In this way, Julian indicates that the accuracy of these data is still reduced in comparison with the "Technical data".
For maximum accuracy the sensors can be calibrated manually – see page 72.

When measuring CO_2, anaesthetic agent and N_2O, their numerical values are shown in grey during the warm-up phase whenever the workstation is switched on.

Because the gas measuring module switches off internally in standby mode, calibration is carried out each time the unit is switched on. This is indicated by »**Cal**« in the measured value window.

The display **CAL** appears instead of the numerical value during automatic calibration of the O_2 sensor (every 24 hours).

The flow sensor is automatically calibrated as soon as a CO_2 signal is detected by the gas measuring system. Julian takes account of the relevant gas mixture when calculating the volumetric concentrations.

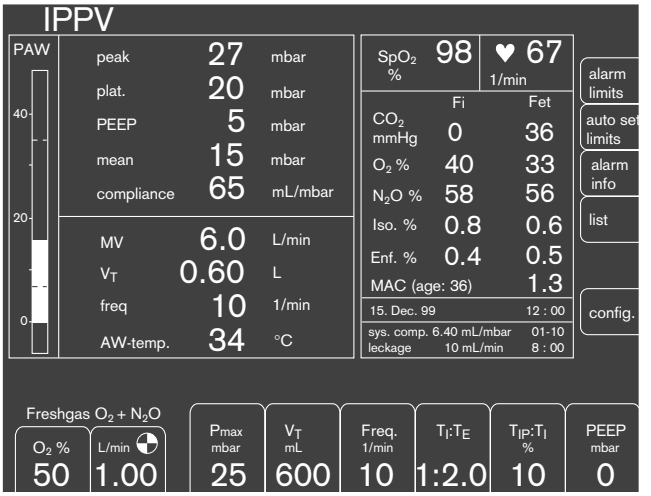
Selecting the data screen

- Press the key several times until the data page appears.

Display (example):

All numerical values are displayed on the data screen with their units of measure. The bar display on the left of the screen shows the change in airway pressure PAW over time. The lines cutting across the bar graph mark the upper and lower alarm limits. To set the alarm limits for PAW, see page 60.

The system compliance (Sys.-Compl.) and leakage are displayed in the right-hand field, together with the time of the last test.



Selecting the trend screen

Displays the measured values over time since the start of measurement.

Maximum storable time: 8 hours.

The following display combinations can be selected:
– CO_2/MV
– AGas/N_2O
– O_2/compliance*
– SpO_2/pulse rate

- Press the key several times until the trend screen appears.

MV and compliance trends are scaled in accordance with the setting in the configuration menu for adults or children.

MV trend scale:

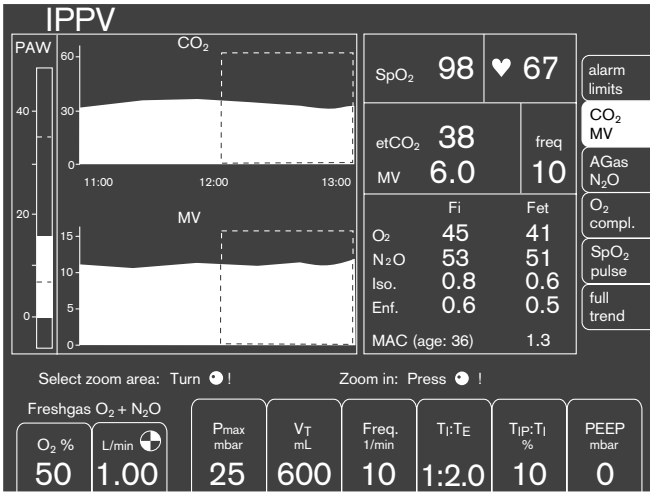
0 to 3 L/min for children
0 to 15 L/min for adults

Compliance trend scale:

0 to 20 mL/mbar for children
0 to 100 mL/mbar for adults

Display (example):

Trend CO_2 and MV



Selecting other display combinations

- Press the appropriate softkey:

  »**AGas N_2O**«
  or
  »**O_2 compl.**«
  or
  »**SpO_2 pulse**«

  The softkey disappears if a measuring function is not available.

* Lung properties can be monitored continuously with the compliance trend display so that ventilation can be adjusted accordingly. Patient compliance is not measured in MAN/SPONT ventilation mode.

Zoom function

The trend display can be magnified with the zoom function after half-an-hour of operation.

To select the range:

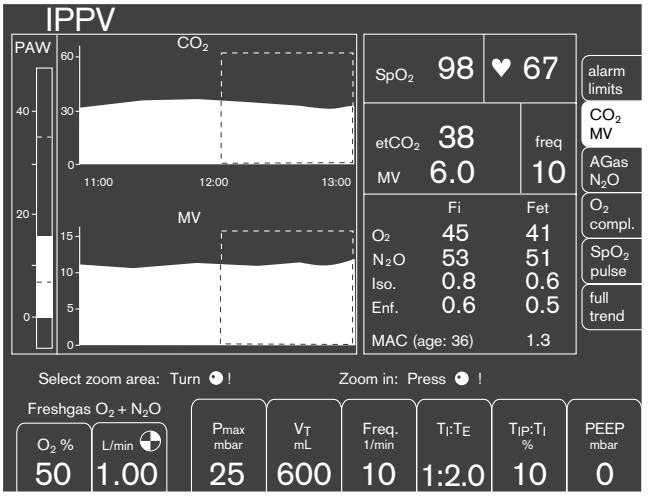
- Turn the rotary knob = the dashed frames move.

To enlarge the selected area to the full width of the display:

- Press the rotary knob.
  A new dashed frame appears after a corresponding period of operation and can also be enlarged.

To return to the overall trend:

- Press the softkey »**full trend**« and the complete trend is displayed again.
  If the trend data are insufficient this softkey has no function.

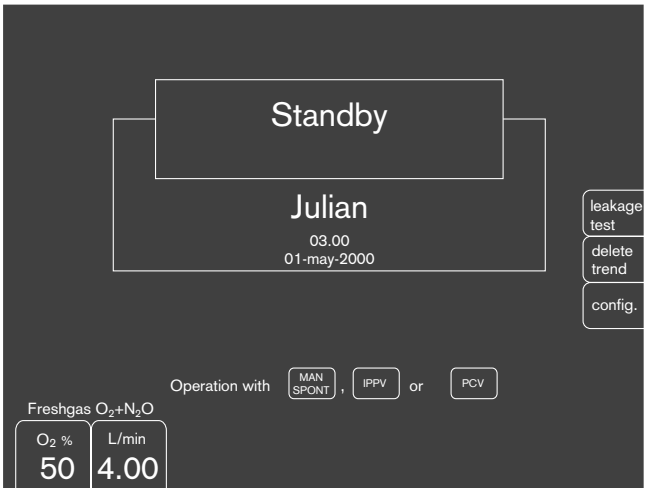


To delete the trend memory

Only possible in standby mode.
The trend memory and list are deleted together!

In standby mode:

- Press the softkey »**delete trend**«.

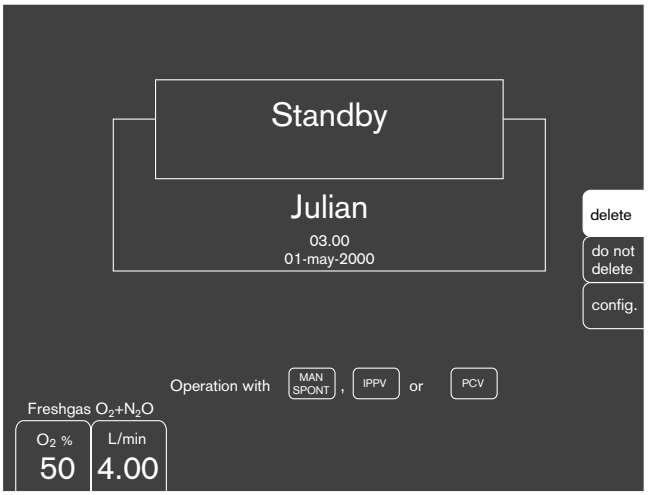


The system asks you to confirm that the trend is really to be deleted.

To delete:

- Press the softkey »**delete**«.

The stored trend for the anaesthetic gas concentration is deleted automatically when a new anaesthetic gas is selected.



Alarms

Displaying and setting alarm limits

Alarms can be displayed and set from all three basic screens (standard, data and trend screen) during operation.

The default alarm limits for the ventilation mode are activated automatically when changing from standby to a ventilation mode.

These default alarm limits can be used unchanged or they can be set individually for the patient.

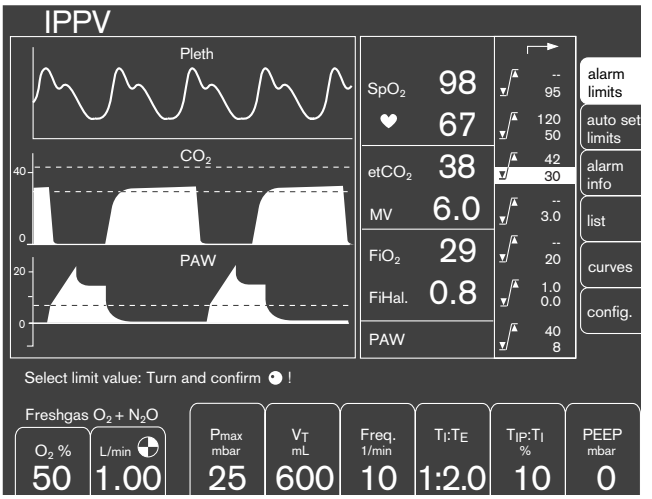
The individual settings are deleted on changing from ventilation mode to standby and the default alarm limits are reactivated.

To call up alarm limits:

- Press the softkey »**alarm limits**«.

Display (example):

The measured values and their alarm limits are shown on the right-hand side.
The curves with the alarm limits represented by dashed lines are shown on the left.



Example $etCO_2$:
The upper alarm limit (42 mmHg) and the lower alarm limit (30 mmHg) are shown alongside the measured value (38 mmHg).

A deactivated alarm limit is indicated by two dashes (– –).

To set an alarm limit:

- Place the cursor bar on the alarm limit by turning the rotary knob and press to confirm.
  The alarm limit is highlighted.
- Set the new value by turning the rotary knob and press to confirm.
  The new alarm limit is now effective. The cursor bar returns to the ⮡ symbol.

Adjustment range of the alarm limits

Alarm limit	Adjustment range
SpO_2 [%]	51 to 100 50 to 99
Pulse ♥ [1/min]	21 to 250 20 to 249
$etCO_2$ [mmHg]	1 to 75 0 to 74
$FiCO_2$ [mmHg]	0 to 10 – –
MV [L/min]	0,1 to 39 0 to 38,9
FiO_2 [Vol.%]	19 to 100 18 to 99
Fi Hal. [Vol.%]	0,1 to 7 0 to 6,9
Fi Iso. [Vol.%]	0,1 to 7 0 to 6,9
Fi Enf. [Vol.%]	0,1 to 7 0 to 6,9
Fi Des. [Vol.%]	0,1 to 21,9 0 to 21,8
Fi Sev. [Vol.%]	0,1 to 9,9 0 to 9,8
PAW [mbar]	5 to 98 4 to 35

To quit the **alarm limits** menu:

- Press the rotary knob
  or
- Press the key.

Adapting limits – AutoSet

When the ventilation settings have been made, Julian can automatically adapt the alarm limits for the minute volume (MV) and airway pressure (PAW) to the current ventilation settings in IPPV mode.

- Press the softkey »**auto set limits**«. The alarm limits menu opens automatically.

The alarm limits for MV and PAW are adapted.
At the same time, an advisory message is displayed: "**MV and PAW limits have been automatically adapted**". The menu closes again automatically after 5 seconds.

The new alarm limits for the set MV are calculated by Julian as follows:

	Upper alarm limit	Lower alarm limit
MV [L/min]	Measured MV · 1,4 At least 2,0	Measured MV · 0,6 At least 0,5

Julian calculates the new PAW alarm limits by determining PEAK, $P_{Plateau}$ and PEEP by two different methods and selecting the higher value as the "measured value".

Method 1:
The mean of the last 4 measured breaths. If fewer measured values are available, these are used as the basis of determination.

Method 2:
The measured value of the last breath.

Julian sets the upper alarm limit for PAW to the absolute higher determined measured value of

– PEAK + 5 mbar or
– $P_{Plateau}$ + 10 mbar, but at not less than 10 mbar in IPPV/PCV.

Julian sets the lower alarm limit for PAW from the determined measured values to

– PEEP + 0,6 · ($P_{Plateau}$ – PEEP),

and not less than 4 mbar in IPPV/PCV.

To reset individual alarm limits for MV and PAW:

- See "Displaying and setting alarm limits" on page 60.

To reuse all default alarm limits:

- See "Activating monitor defaults" on page 72.

If an alarm occurs

Alarm messages are assigned to three priority classes by Julian, depending on their urgency, and identified by exclamation marks:

Warning !!! = message with top priority
A warning message requires immediate action.

Caution !! = message with medium priority
A caution message requires prompt action.

Advisory ! = message with lowest priority
Least-priority messages can also be displayed by symbols. An advisory message requires to be noted and action taken if necessary.

If several alarms occur simultaneously, Julian displays the alarm with the highest priority. The others are not displayed.

All warning, caution and advisory messages that have been emitted can be displayed by pressing the »**alarm Info**« softkey.

Each time an alarm message is displayed, the alarm lamp either flashes or lights up continuously and an audible tone sequence is emitted to indicate the alarm priority class:

Warning:

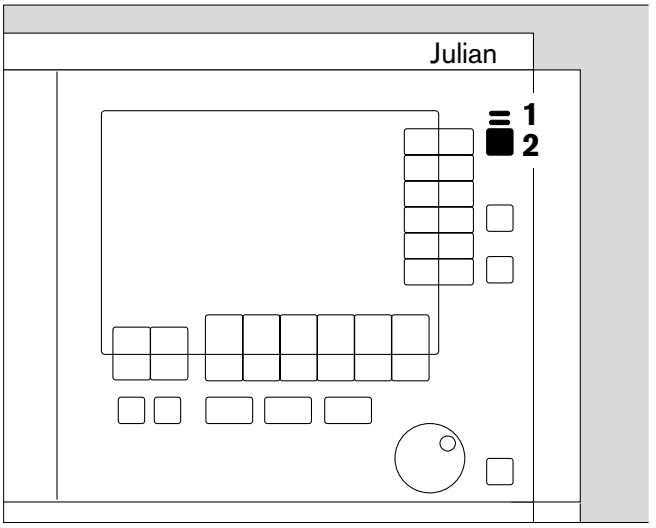
1 Red lamp flashes, accompanied by a continuous tone.

Caution:

1 Yellow lamp flashes, accompanied by an intermittent tone every 30 seconds.

Advisory:

1 Yellow lamp lights up continuously, accompanied by a single tone.



The alarm tone can be suppressed for two minutes:

2 Press the [🔔] key and its yellow LED lights up.

To reactivate the alarm tone:

2 Press the [🔔] key and its yellow LED goes out.

A list of alarm messages can be found on page 122, "Message – Cause – Remedy".

Alarm info

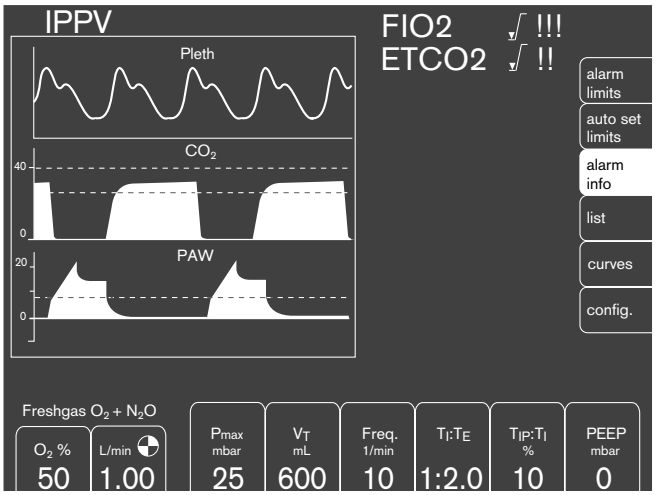
This function is used to list all active alarms / warnings in order of priority.

- Press and hold the softkey »**alarm info**«.

Display (example):

Active alarms:
FIO2 !!!

Active warning:
ETCO2 !!



The display only remains visible as long as the softkey is pressed.

CO_2 alarms on /off

The alarm limits for $FiCO_2$, $etCO_2$ and CO_2 apnoea monitoring can be switched off with the softkey »**CO2-al. on/off**« in MAN/SPONT mode.

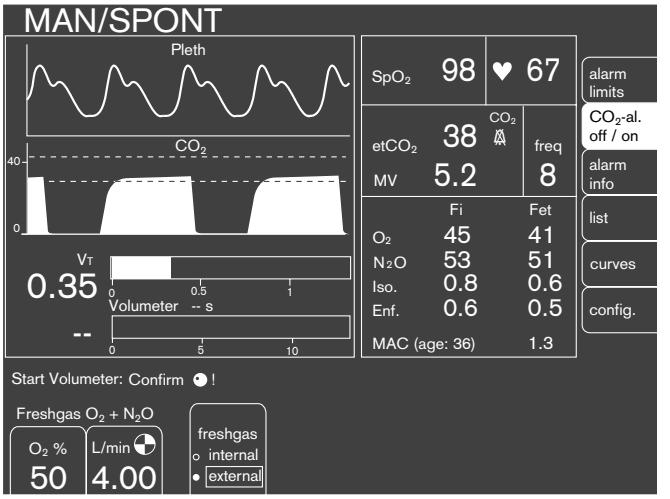
In this case, the symbol **CO2** appears alongside the measured end-expiratory CO_2 concentration.

The CO_2 alarm limits are reactivated by pressing the softkey again. The deactivated CO_2 alarm limits are reactivated automatically when changing to a different ventilation mode.

The CO_2 alarm limits can also be activated and deactivated under "Alarm limits" in the configuration screen in all ventilation modes, see page 72.

The $etCO_2$ and $FiCO_2$ alarms can be configured »**ON**« or »**OFF**« in standby mode for the transition from MAN/SPONT. When the alarm limits are set to »**ON**«, the value is transferred from automatic ventilation mode.

National and European standards require a minimum monitoring with alarm function. These standards may not be met if the alarm function of the $etCO_2$ monitoring parameter is deactivated.

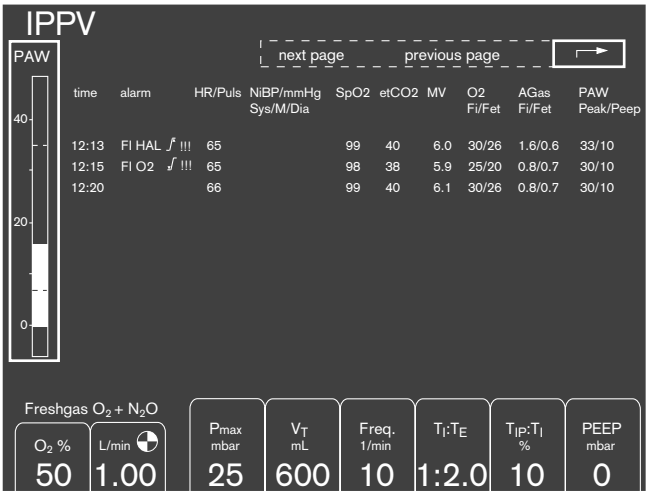


List display

Record of measured values, alarms and ventilation modes to facilitate compilation of the anaesthetic record. The control criteria for entries can be configured, see "Record" on page 71.

- Press the softkey »**list**«.

Display (example):



"Open" the previous page:

- Select »**previous page**« by turning the rotary knob and press to confirm.

"Open" the next page:

- Select »**next page**« by turning the rotary knob and press to confirm.

Return to the standard page:

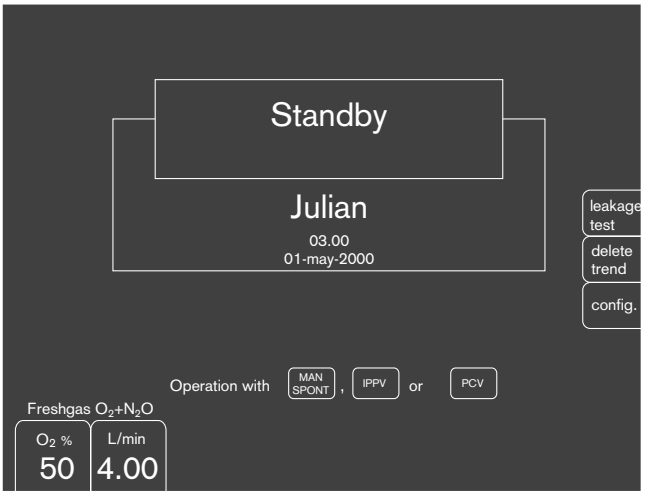
- Place cursor on the ⮡ symbol by turning the rotary knob and press to confirm.

or

- Press the key.

Delete list

The list and trend memory are deleted together! Only possible in standby!



In standby:

- Press the softkey »**delete trend**«.

Delete trends and list:

- Press the softkey »**delete**«.

Selecting curves

Only possible from the standard screen!

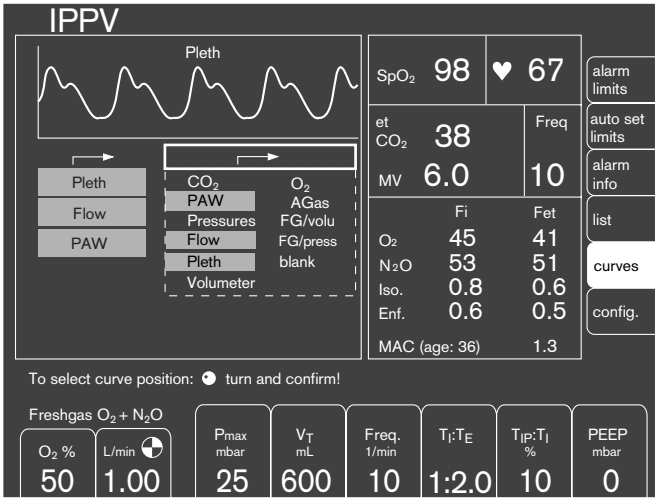
Three curves can be selected and positioned for the momentary ventilation mode in this menu.

The following curves can be selected:

CO_2	Curve of CO_2 concentration at the Y-piece
PAW	Airway pressure
Pressures	Digital indication of the measured value for P_{PEAK}, $P_{Plateau}$, P_{MEAN} and PEEP
Flow	Expiration flow
Pleth	The plethysmogram derived from SpO_2 measurement (optional)
Volumeter	A display mode showing the minute volume and tidal volume V_T as bar graphs
O_2	Curve of O_2 concentration at the Y-piece
AGas	Curve of anaesthetic agent concentration at the Y-piece
FG/volu	Volumeter in combination with bar display of fresh gas flow in L/min for O_2 and N_2O or AIR (virtual flow tubes)
FG/press	Pressures in combination with bar display of fresh gas flow in L/min for O_2 and N_2O or AIR (virtual flow tubes)
blank	Blank field

- Press the softkey »**curves**«.

Display (example):



The names of the curves in each curve field are displayed together with the choice of possible parameters. The current curves are highlighted by a grey background.

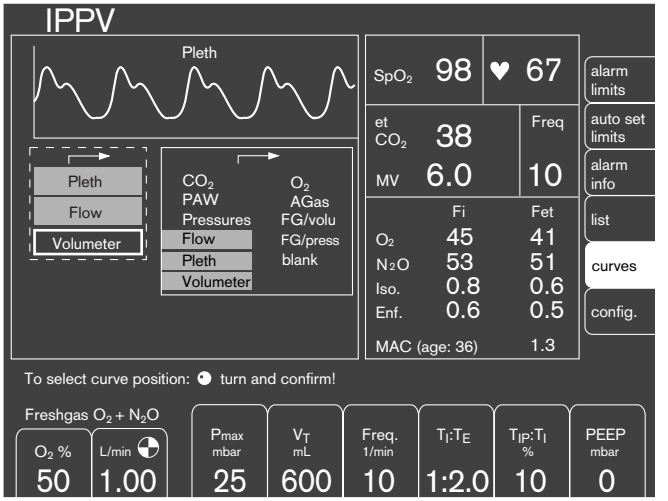
In the example, the PAW curve is to be replaced by the volumeter display.

- Turn the rotary knob to select the required parameter (»**volumeter**«) and press to confirm.

The cursor jumps to the ⮡ symbol of the positioning menu.

- Select the desired position with the rotary knob and press to confirm.

Display (example):



The curve is replaced and the cursor returns to the ⮡ symbol in the selection menu.

To return to the standard page:

- Press the rotary knob.

If a curve field is to remain blank:

- Select »**blank**« with the rotary knob and press to confirm.

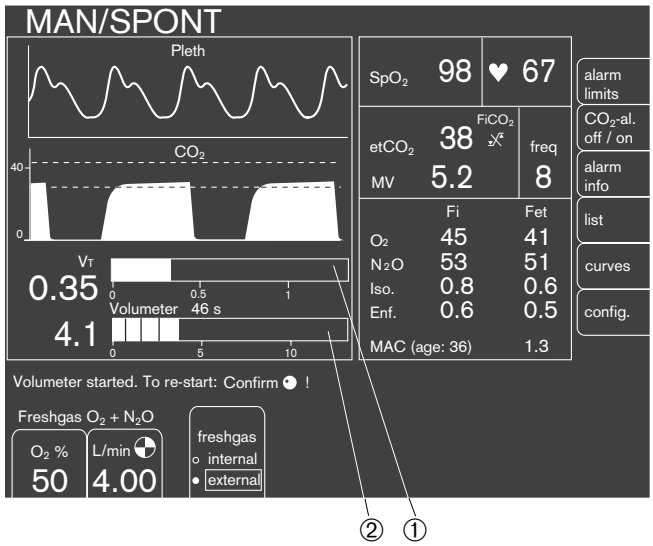
Using the volumeter function

To observe and assess ventilation in manual and pressure controlled ventilation modes and during spontaneous breathing.

① Upper bar:
Current tidal volume VT, preceded by the numerical value.

② Lower bar:
Volumeter (minute volume measurement), preceded by the numerical value.

The scale of the bar display depends on the default setting, see "Configuring in operation, selecting the scale" on page 69
and "Configuring in standby mode, selecting the scale" on page 83.



Setting	Tidal volume VT in L	Minute volume MV in L/min
Scale for children	0.2	2
Scale for adults	1.0	10

Starting the volumeter

- Press the rotary knob.
  The values are deleted and volumeter restarted if the rotary knob is pressed again before 60 seconds have elapsed.

The elapsed time in seconds is displayed above the bar with the summed volume on the left. The individual breaths are separated by segments in the bar. The volumeter stops automatically with an acoustic signal after 60 seconds.
The measured values are displayed for 4 minutes and then erased.

Display combination with flow tubes

See »**Selecting curves**« for selection of display combinations.

Possible combinations:

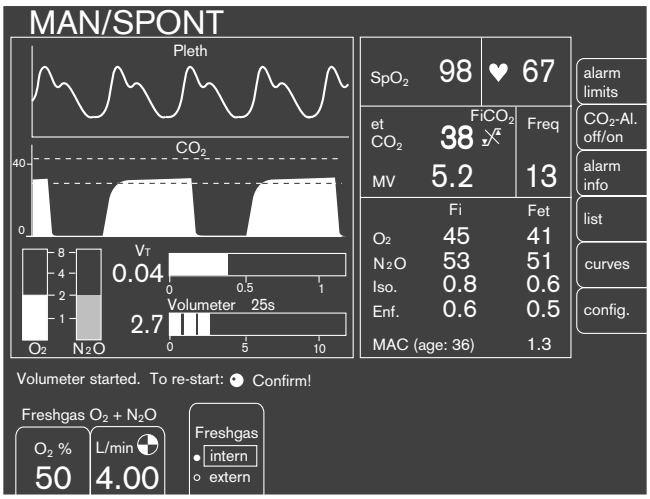
– »**FG/volu**« or

– »**FG/press**«

The fresh gas flow in L/min (O_2, N_2O or AIR) is displayed in the flow tubes.

Display (example):

- »**Start volumeter**«, see »**Using the volumeter function**«, page 67.

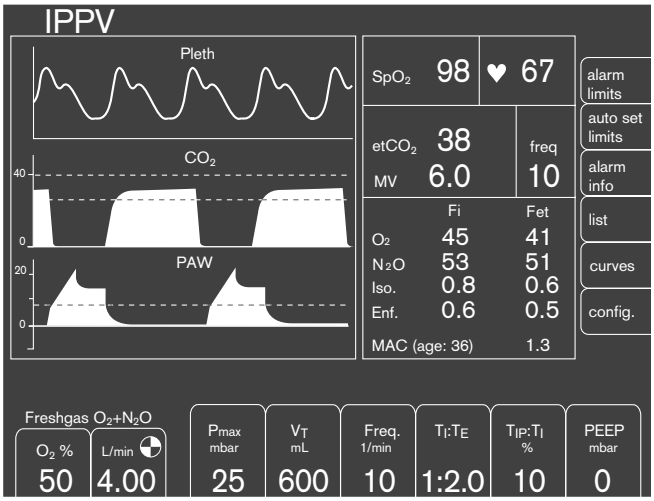


Configuring in operation

The configuration menus are used to select or modify individual monitoring functions for the measurements in progress.
The settings entered here are only valid while measurement is in progress and are deleted on switching to standby mode.

In the standard screen (example) or data screen:

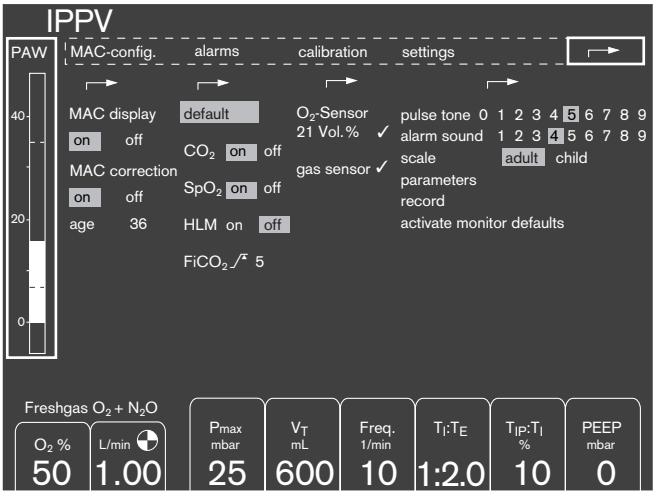
- Press the softkey »**config.**«.



Display (example):

The softkeys for fresh gas and ventilation parameters remain active.

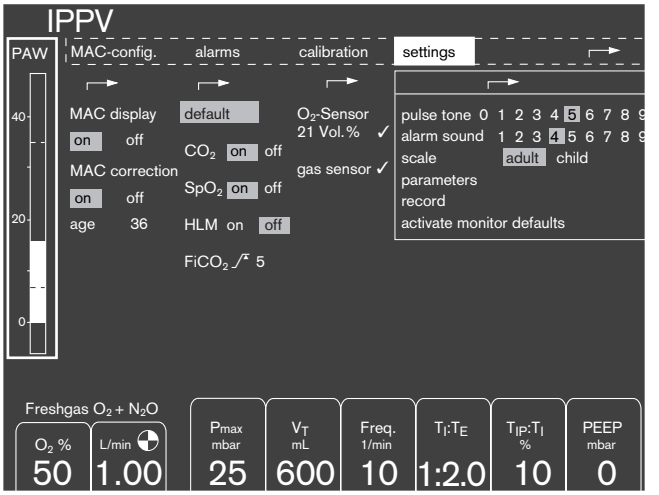
The values highlighted in grey represent the current settings.



Setting the monitoring functions

- Select the »**settings**« column by turning the rotary knob and press to confirm.

Display (example):



Setting the pulse tone

0 = OFF
9 = Maximum volume

- Select the line »**pulse tone**« by turning the rotary knob and press to confirm. The cursor automatically jumps to the last value selected (in the example: setting 5).
- Set the value with the rotary knob and press to confirm.

Setting the alarm sound

1 = Minimum volume
9 = Maximum volume

- Select the line »**alarm sound**« by turning the rotary knob and press to confirm. The cursor automatically jumps to the last value selected (in the example: setting 4).
- Set the value with the rotary knob and press to confirm.
  Set a sufficiently loud alarm sound!

The audible »**NO O2**« and »**NO FRESH GAS**« alarms are always sounded at maximum volume.

Julian complies with national regulations in certain countries that stipulate a minimum volume of 45 dB (A). Settings 1 to 4 are programmed at 45 dB (A) for these countries.

Selecting the scale

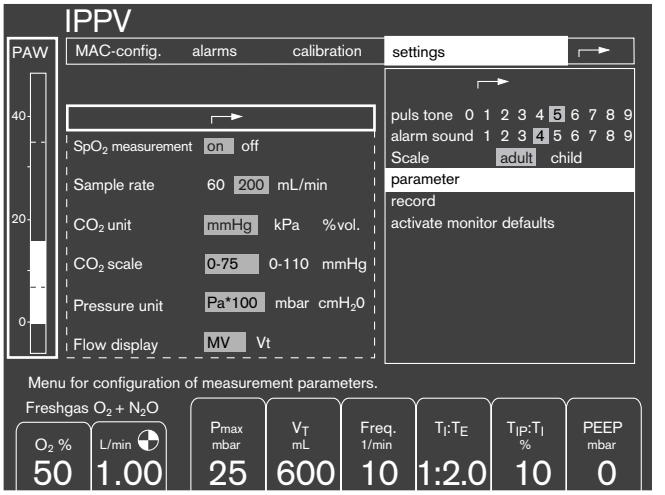
To adapt the scale for the volumeter function and trend curve.

- Select the line »**scale**« with the rotary knob and press to confirm.
- Select »**adult**« or »**child**« with the rotary knob and press to confirm.

Setting the measuring parameters

- Select the line »**parameters**« with the rotary knob and press to confirm.
  The »**parameters**« menu appears in the left-hand field.

Display (example):



Switch SpO2 measurement (optional) on/off:

- Select the line »**SpO2 measurement**« with the rotary knob and press to confirm.
- Select »**on**« or »**off**« with the rotary knob and press to confirm.

Select the sample rate for gas measurement:

- Select the line »**sample rate**« with the rotary knob and press to confirm.
- Select »**60**« or »**200 mL/min**« with the rotary knob and press to confirm.

For paediatric use:

- Select a sample rate of 200 mL/min in order to obtain more accurate values on account of the high frequencies and time constant of the measuring system.
- Recirculate the measured gas, see page 111.

If the measured gas is not recirculated:

- Increase the minute volume accordingly in order to maintain the volume balance.

For adult use:

- Select a sample rate of 60 or 200 mL/min. Recommendation: select 200 mL/min and recirculate the measured gas, see page 111.

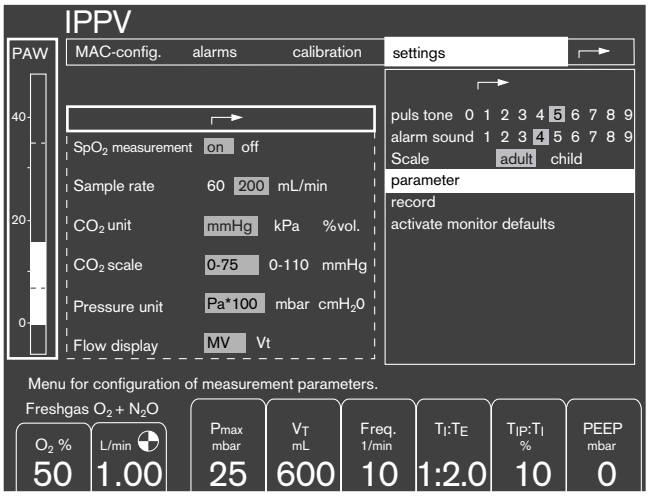
Set CO2 unit:

- Select the line »**CO2 unit**« with the rotary knob and press to confirm. Either mmHg, kPa or %vol. can be selected as the unit of measurement for CO2.
- Select the required unit of measure by turning the rotary knob and press to confirm.

Selecting CO_2 scale:

- Select the line »**CO_2 scale**« by turning the rotary knob and press to confirm.
- Select the required scale by turning the rotary knob and press to confirm.
  The »**CO_2 scale**« can be selected between two fixed default values. The value depends on the CO_2 unit chosen.

Display (example):



Setting pressure unit:

- Select the line »**Pressure unit**« by turning the rotary knob and press to confirm.
- Select »**Pa*100**« or »**mbar**« or »**cmH2O**« by turning the rotary knob and press to confirm.

Setting flow display:

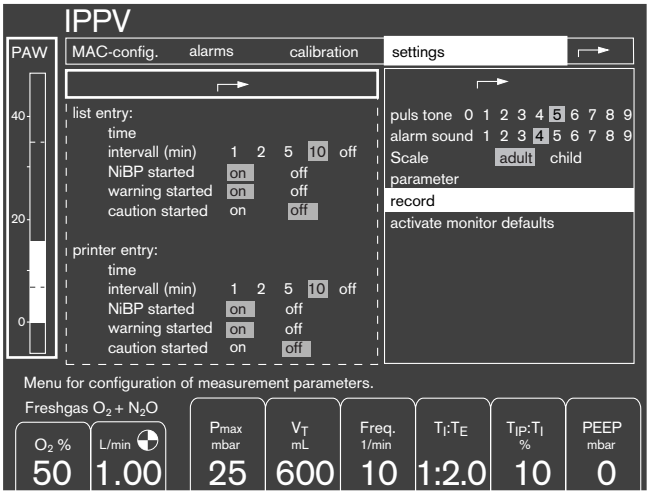
- Select the line »**Flow display**« by turning the rotary knob and press to confirm.
- Select »**MV**« or »**Vt**« by turning the rotary knob and press to confirm. The selected parameter is displayed on the standard page. Vt alarm limits are not monitored. The alarm limits set for MV continue to be monitored in operation.

Record

This function is used to determine the type of event that triggers an entry in the record list or a printout on the connected logging printer.

- Select the line »**record**« with the rotary knob and press to confirm.
  The »**record**« menu appears on the left-hand side.

Display (example):



Time
interval-started **(min)**
A list entry is activated after a fixed time interval in minutes.

NiBP-started
An entry is made after every NiBP measurement with new measured values. This entry can be read by an external Dräger monitor via the MEDIBUS interface.

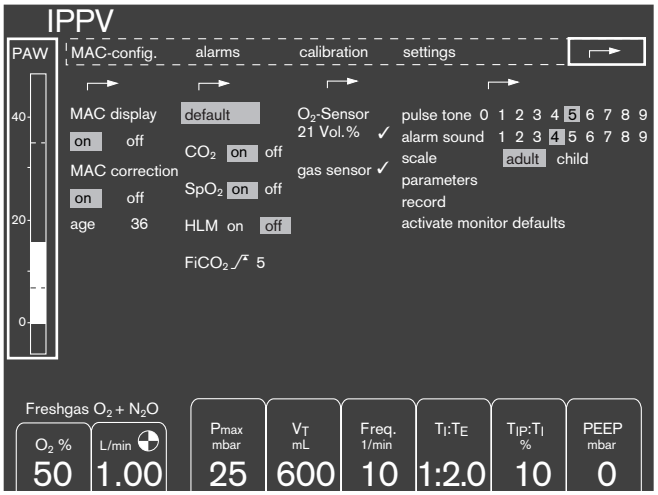
warning-started
An entry is made whenever an alarm is triggered.

caution-started
An entry is made whenever a caution message is triggered.

- Turn the rotary knob to select the event triggering the entry and press to confirm.

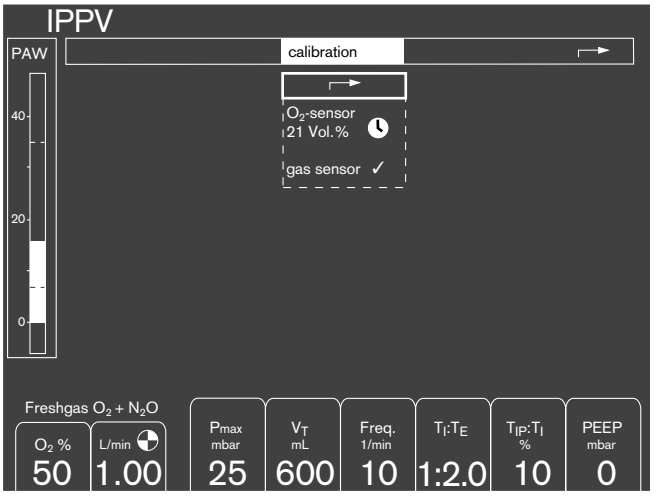
Manual calibration

Julian calibrates its sensors automatically during operation. While calibration is in progress, the letters "CAL" appear in place of the respective measured value. Calibration of the O2 sensor and zero alignment for the other gas sensors can be repeated manually, for instance if automatic calibration has not been successfully performed.



- Turn the rotary knob to select the »**Calibration**« column and press to confirm.
- Turn the rotary knob to select the corresponding line and press to confirm, e.g.
  »**O2 sensor 21% by vol.**«

Confirming the selection starts the respective calibration procedure. The clock symbol appears behind the line = calibration is in progress.



Once calibration has been completed, a tick (✓) appears in place of the clock symbol. A question mark (**?**) indicates that calibration should be repeated, because the previous calibration was defective.

Other settings can be altered even though calibration is in progress.

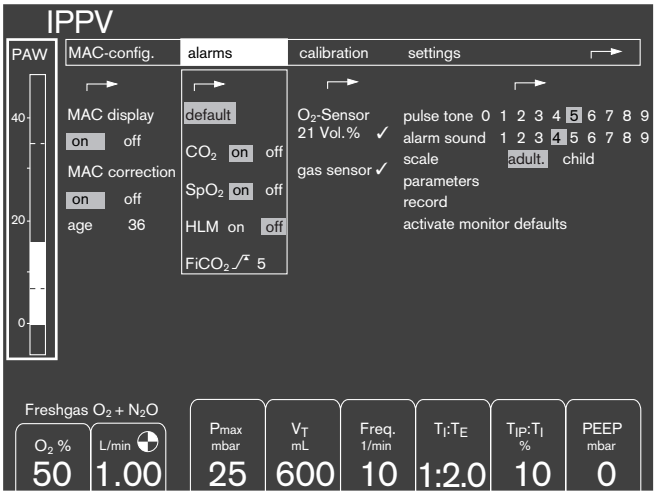
Activating monitor defaults

This function is used to activate the default monitoring settings configured in standby mode and active whenever the apparatus is switched on.

- Select the line »**activate monitor defaults**« with the rotary knob and press to confirm.

Selecting alarms

- Turn the rotary knob to select the column »**alarms**« and press to confirm.



Default

This function is used to activate the default alarm limits set in the standby configuration which are effective whenever the apparatus is switched to standby.

Setting default alarm limits:

- Select the »**default settings**« menu by turning the rotary knob and press to confirm.
  See page 88 for the further procedure.

CO_2 alarms on/off

To activate / deactivate all CO_2 alarms, including the apnoea alarm.

- Turn the rotary knob to select »**CO_2 on**« or »**CO_2 off**« and press to confirm.

SpO_2 alarms on/off

To activate/deactivate all SpO_2 alarms.

- Turn the rotary knob to select »**SpO_2 on**« or »**SpO_2 off**« and press to confirm.

Deactivated alarms are indicated by the symbol in the measurement field with a corresponding message. If all the alarms for this measured value are deactivated, this is indicated by the symbol and a corresponding message.

National and European standards require minimum monitoring with alarm function. These standards may not be met when the alarm function of the monitoring parameter $etCO_2$ or SpO_2 is deactivated.

Alarm mode for the heart-lung machine HLM

HLM alarm mode can be used independently of the active ventilation mode for patient monitoring when using the heart-lung machine.

In HLM alarm mode,

– all apnoea alarms are deactivated.

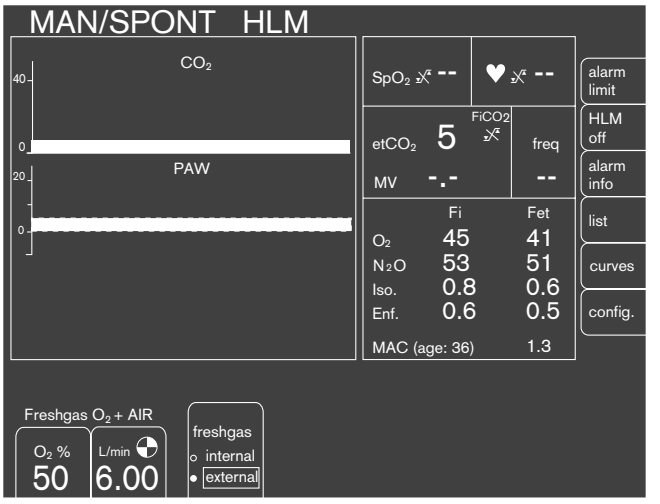
– the gas concentrations are measured continuously regardless of the respiratory phase.

– the SpO_2 alarms are deactivated.
They are reactivated automatically when pulsations are detected by the apparatus again after switching off the HLM alarm mode.

Selecting HLM alarm mode

- Press the softkey »**config**«.
- Turn the rotary knob to select the column »**alarms**« and press to confirm.
- Turn the rotary knob to select the line »**HLM on**« and press to confirm.

Display (example):

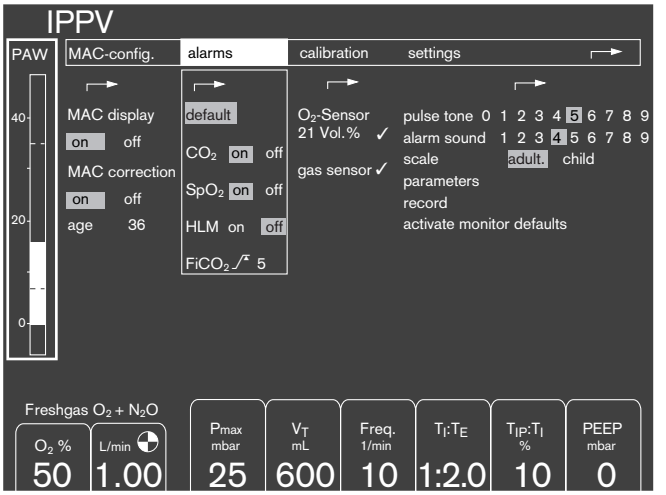


The lung is kept open with constant airway pressure.

HLM alarm mode can be switched off at any time:

- Press the softkey »**HLM off**«.

In standby mode, the HLM alarm mode is automatically deactivated.



Setting FiCO2 alarm limit

To set the upper inspiratory CO2 alarm limit.

- Select »**FiCO2**« by turning the rotary knob and press to confirm.
- Set required value by turning the rotary knob and press to confirm.

MAC configuration

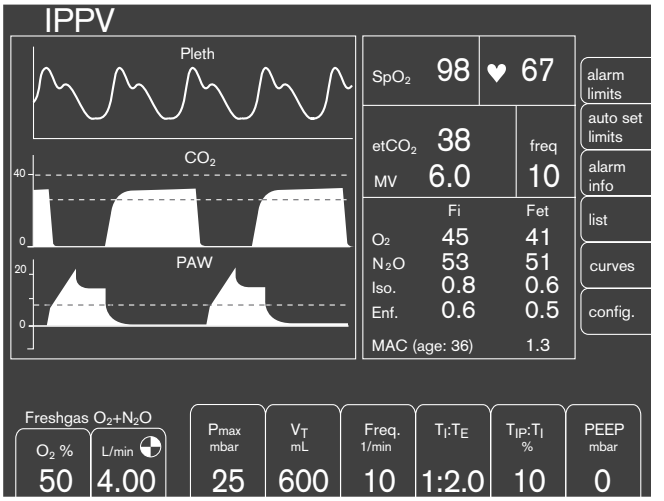
Anaesthetic agent identification and display

Julian automatically identifies the anaesthetic agent used and adjusts the measurement and monitoring of the anaesthetic gas concentration to suit the gas identified.

If there is a mixture of two volatile anaesthetic agents, the concentration of the secondary anaesthetic agent is displayed from a MAC value of 0.1 MAC upwards. The gas with the higher expiratory MAC value is displayed above the secondary gas.

A secondary anaesthetic agent becomes the main anaesthetic agent if its MAC value exceeds the MAC value of the main anaesthetic agent by 0.2 MAC.

A mixture of more than 2 volatile anaesthetic agents cannot be reliably detected.



Calculating the MAC values

Julian calculates the MAC value (Minimum Alveolar Concentration) from the linear total of volatile anaesthetic agents measured and N2O. The measured values used are the end-expiratory concentrations. Partial pressures are taken into account.

Age-corrected MAC values are calculated according to W. W. Mapleson, British Journal of Anaesthesia 1996, pp. 179-185.

Displaying MAC

To activate the MAC display:

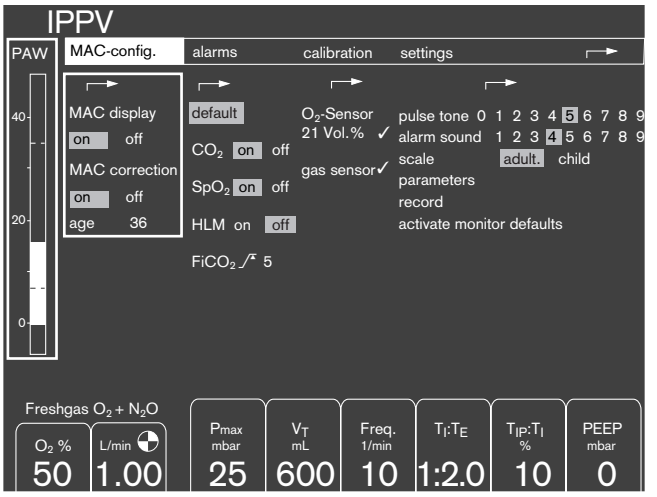
- Select column »**MAC config.**« by turning the rotary knob and press to confirm.
- Select line »**MAC display**« by turning the rotary knob and press to confirm.
- Select line »**on**« by turning the rotary knob and press to confirm.

To select the age correction for the MAC display:

- Select line »**MAC correction**« by turning the rotary knob and press to confirm.
- Select line »**on**« by turning rotary knob and press to confirm.

To select the patient's age:

- Select line »**age**« by turning the rotary knob and press to confirm.
- Set age by turning the rotary knob and press to confirm.



If the MAC display is configured to »**off**«, the »**MAC correction**« and »**age**« lines are automatically dimmed.

If MAC correction is configured to »**off**«, the »**age**« line is automatically dimmed.

MAC-Definition:
1 MAC is equal to the anesthetic gas concentration at which 50% of all patients no longer respond to a stimulation of the nerves.
The influence of other medication(opiates or intravenous hypnotics) is not taken into consideration when calculating MAC values.

SpO2 Measurement (optional)

Sensor selection

Only use Nellcor sensors.
Note the Instructions for Use of the sensors –
incorrect positioning or use can cause tissue damage.

Select the sensor according to the following criteria:

- Patient weight
- Patient mobility
- Possible application site
- Patient perfusion
- Duration of use

The following table listing the specific sensor types available and their characteristics is intended as an aid for selection.

Sensor type	**OXISENSOR I-20**	**OXISENSOR D-20**	**DURASENSOR DS-100 A**	**OXISENSOR D-25**	**OXISENSOR R-15**
Age group	Infants	Children	Adults	Adults	Adults
Patient weight	1 to 20 kg	10 to 50 kg	>40 kg	>30 kg	>50 kg
Duration of use	Short and long-term monitoring	Short and long-term monitoring	Short-term monitoring	Short and long-term zeitüberwachung	Short and long-term monitoring
Patient mobility	Limited mobility	Limited mobility	Immobile patients only	Limited mobility	Immobile patients only
Preferred measuring site	Toe	Finger	Finger	Finger	Nose
Sterility[1)]	Sterile packaging	Sterile packaging	____	Sterile packaging	Sterile packaging

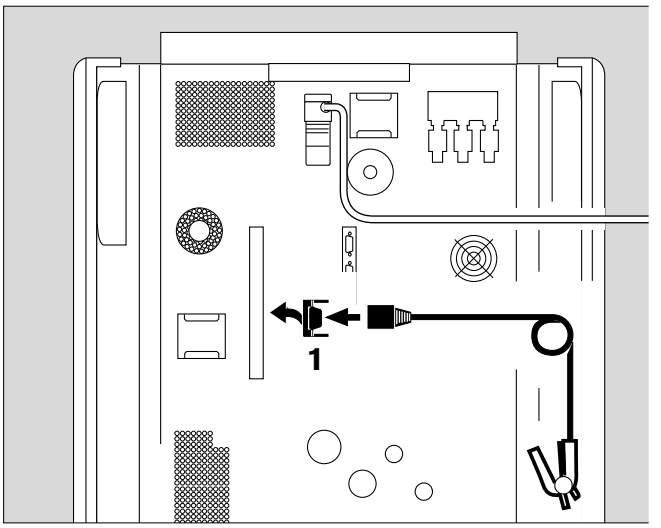
OXISENSOR ™ I-20, OXISENSOR ™ D-20, DURASENSOR ™ DS-100 A, OXISENSOR ™ D-25 and OXISENSOR ™ R-15 are registered trademarks.

1) in unopened, undamaged packaging

- Select the appropriate sensor.

On back of unit:

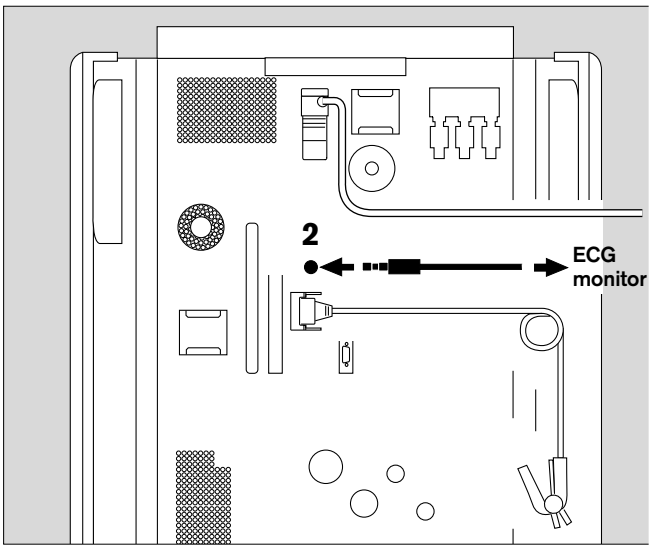
1 Swing the flap over the socket »**SpO2**« to the left and insert the sensor plug.



C-lock-ECG synchronization (optional)

If the patient is highly agitated or the arterial flow is very low, the measurement signals of the SpO2 measurement can be improved with the C-Lock-ECG synchronization. In this case, Julian receives two separate signals that transmit the heart activity:

– An optical signal from the SpO2 sensor
and
– An electrical signal from the separate ECG monitor.



Julian uses the R-wave of the ECG signal to identify the pulse and to synchronize with the SpO2 measurement.

2 Channel the ECG signal of the ECG monitor with the cable andyesck-plug to the back of the Julian (»**Sync.**« socket).
See the "Technical data" on page 133 for the requirements for the electrical signal and plug layout.

In the event of a delayed ECG signal

Synchronization may be impaired if the ECG signal is delayed by more than 40 milliseconds to the QRS complex.

If you suspect a fault of this kind:

- Use the Julian without C-Lock-ECG synchronization.

Tips to prevent artefacts

Only use Nellcor sensors in the recommended positions, otherwise incorrect measurements and tissue damage may result.

Damaged sensors with exposed electrical contacts must not be used – danger of electric shock.

Used adhesive strips of the Oxiband-OXI-A/N and OXI-P/I sensor must not be reused, as they may not adhere properly.
The strips must not be stretched unduly.
Never use two strips together, as this may lead to venous pulsation and failure of the pulse signal.

High intrathoracic pressure, pressure on the thorax and other consecutive impairments of the venous flow can lead to venous pulsation with failure of the pulse signal.

The pulse signal may fail in the presence of shock, low blood pressure, severe vasoconstriction, major anaemia, hypothermia, arterial occlusion proximal to the sensor and asystolia.

The sensor must be protected from exposure to bright light (e.g. surgical lamps and direct sunlight), otherwise the pulse signal may fail or inaccurate results may be obtained.

The sensor should not be positioned on limbs together with an arterial catheter, sphygmomanometer cuff or intravascular venous infusion, otherwise the pulse signal may fail and measurement become inaccurate.

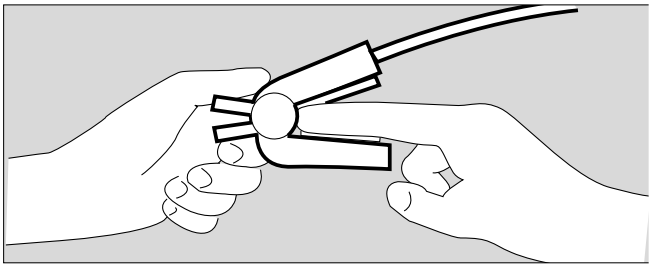
Measurement accuracy may be reduced in the presence of significant concentrations of dyshaemoglobins, such as carboxyhaemoglobin or methaemoglobin.

Intravascular dyes, such as methylene blue, may also impair measurement accuracy.

Electrocautery can impair the measuring accuracy; the leads and sensor should therefore be positioned as far away as possible from the electrocautery and its neutral electrode.

Sensor performance may be impaired and lead to inaccurate results if the patient moves violently. The sensor should be applied to a different site in such cases in order to reduce the risk of artefacts due to movement.

Applying the Durasensor DS-100 A



Reusable sensor for short-term monitoring of relatively quiet patients weighing over 40 kg.

The sensor is preferably positioned on the index finger, although other fingers can also be used. The little finger should be used if the patient is particularly large or obese.

- Open the clip slightly and slide the sensor onto the finger. The tip of the finger must touch the end and the soft padding should rest on the nail and tip of the finger. The lead should be on top of the finger.
- Ensure that the finger is not compressed or hurt by the clip.
- Change the application site after not more than 4 hours in order to avoid a build-up of blood pressure (blocked circulation).

Follow the specific Instructions for Use when using other Nellcor sensors!

Airway temperature measurement (optional)

Parts required:

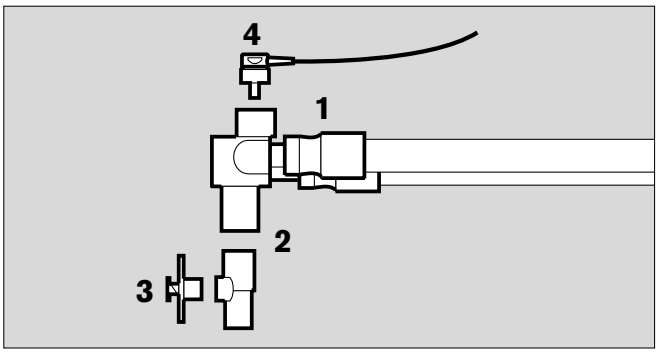
- Temperature sensor 84 05 371
- Y-piece with connection for temperature sensor M 30 543
- T-piece 86 00 224
- Filter with Luer lock connection for gas measurement 86 00 225

1 Connect Y-piece to respiratory hoses.

2 Insert T-piece into Y-piece.

3 Insert filter into T-piece.

4 Insert temperature sensor into Y-piece.

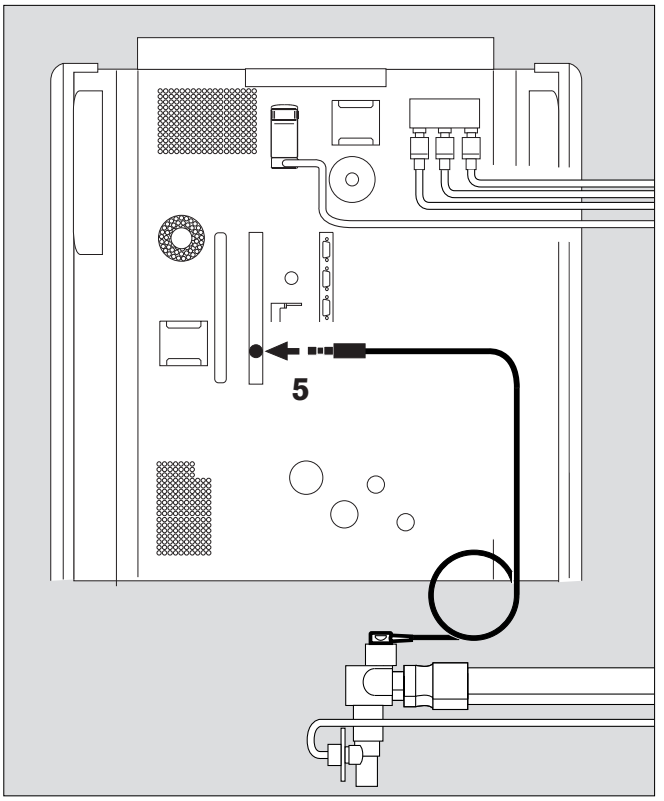


5 Connect temperature sensor plug to »**Temp.**« socket at the back of the workstation.

- The airway temperature is displayed in the data section of the screen:

  AW temp. XX °C

The upper alarm limit is fixed. If the airway temperature exceeds 40°C, the »**AW Temp** ⚠ **!!!**« alarm will be activated.



Configuring in Standby Mode

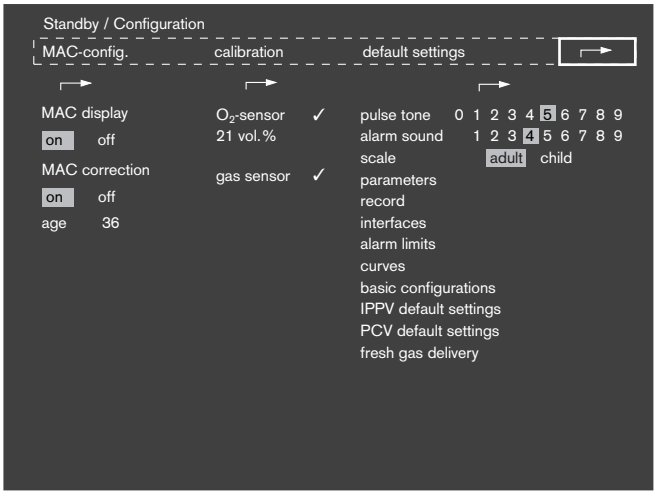
Contents

Configuring in Standby Mode

The default settings for the monitoring functions and the fresh gas and ventilation parameters can be configured in standby mode. The default values of the monitoring functions apply each time the unit is switched on. The default values for the alarm limits, fresh gas parameters and ventilation parameters are valid after each standby.

- Switch Julian to standby mode.
- Press the softkey »**config.**«.

Display (example):



The following settings can be made in the menu:

– **MAC config.**

– **Calibration**

– **Default settings**

Fields highlighted by a grey background contain the currently valid settings.

The symbol ↵ indicates a return to the previous menu level.

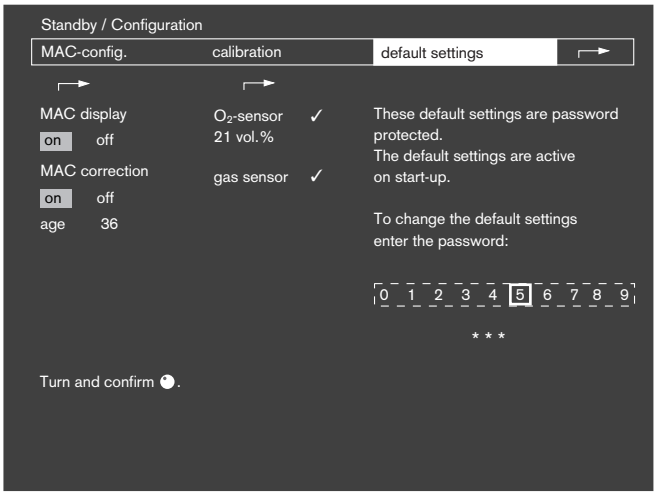
- Select, set and confirm the new settings with the rotary knob.

Setting default values

Default values are valid whenever the apparatus is switched on. The default monitoring settings can be activated during operation with **activate monitor defaults,** see "Activating monitor defaults" on page 72.

- Select and confirm the **default settings** with the rotary knob.

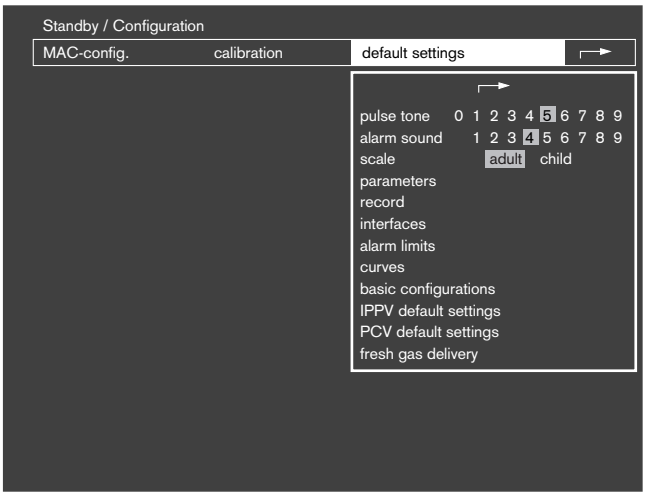
Display (example):



The menu requests the user to enter a 4-digit password in order to prevent unauthorized tampering with the basic settings. This password is notified during system training. The function can be disabled by DrägerService if required.

- Turn the rotary knob to select the digits con-secutively from the line provided and press to confirm. The password is indicated underneath with asterisks (* * * *). The menu for selecting the default settings appears when the password has been entered correctly.

Display (example):



Setting the pulse tone (optional)

0 = OFF
9 = Maximum volume

- Select the line »**pulse tone**« by turning the rotary knob and press to confirm. The cursor automatically jumps to the last value selected (example 5).
- Set the value with the rotary knob and press to confirm.

Setting the alarm sound

1 = Minimum volume
9 = Maximum volume

- Select the line »**alarm sound**« by turning the rotary knob and press to confirm. The cursor automatically jumps to the last value selected (example 4).
- Set the value with the rotary knob and press to confirm.
  Set a sufficiently loud alarm sound!

The audible »**NO O_2**« and »**NO FRESH GAS**« alarms are always sounded at maximum volume.

Julian complies with national regulations in certain countries that stipulate a minimum volume of 45 dB (A). Settings 1 to 4 are programmed at 45 dB (A) for these countries.

Selecting the scale

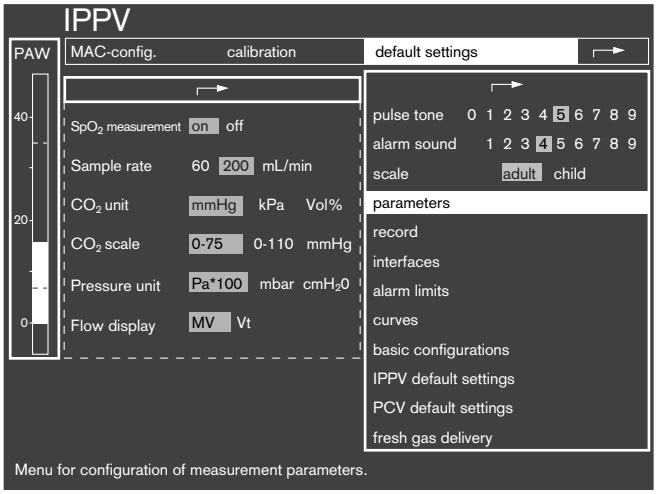
To adapt the scale for the volumeter function and trend curve.

- Select the line »**scale**« with the rotary knob and press to confirm.
- Select »**adult**« or »**child**« with the rotary knob and press to confirm.

Setting the measuring parameters

- Select the line »**parameters**« with the rotary knob and press to confirm.
  The »**parameters**« menu appears in the left-hand field.

Display (example):



Switch SpO_2 measurement (optional) on/off:

- Select the line »**SpO_2 measurement**« with the rotary knob and press to confirm.
- Select »**on**« or »**off**« with the rotary knob and press to confirm.

Select the sample rate for gas measurement:

- Select the line »**sample rate**« with the rotary knob and press to confirm.
- Select »**60**« or »**200 mL/min**« with the rotary knob and press to confirm.

For paediatric use:

- Select a sample rate of 200 mL/min in order to obtain more accurate values on account of the high frequencies and time constant of the measuring system.
- Recirculate the measured gas, see page 111.

If the measured gas is not recirculated:

- Increase the minute volume accordingly in order to maintain the volume balance.

For adult use:

- Select a sample rate of 60 or 200 mL/min. Recommendation: select 200 mL/min and recirculate the measured gas, see page 111.

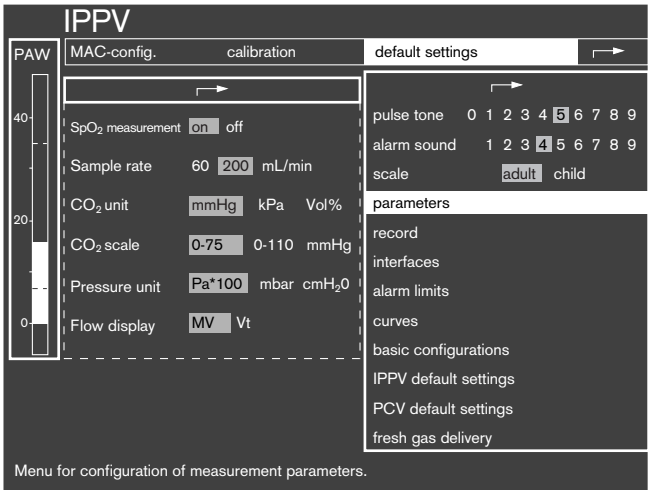
Set CO_2 unit:

- Select the line »**CO_2 unit**« with the rotary knob and press to confirm. Either mmHg, kPa or %vol. can be selected as the unit of measurement for CO_2.
- Select the required unit of measure by turning the rotary knob and press to confirm.

Selecting CO_2 scale:

- Turn rotary knob to select »**CO_2 scale**« line and press to confirm.
- Turn rotary knob to select required scale and press to confirm.
  The »**CO_2 scale**« can be selected between two fixed default values. The value depends on the CO_2 unit chosen.

Display (example):



Setting pressure unit:

- Turn rotary knob to select the »**Pressure unit**« line and press to confirm.
- Turn rotary knob to select »**Pa*100**« or »**mbar**« or »**cmH2O**« and press to confirm.

Setting flow display:

- Turn rotary knob to select »**Flow display**« line and press to confirm.
- Turn rotary knob to select »**MV**« or »**Vt**« and press to confirm.

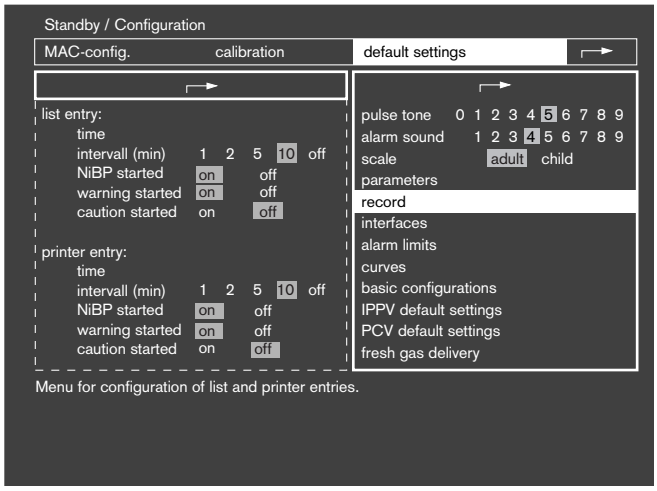
Julian displays the selected parameters on the standard page. Vt alarm limits are not monitored. The alarm limits set for MV continue to be monitored in operation.

Record

This function is used to determine the type of event that triggers an entry in the record list or a printout on the connected record printer.

- Select the line »**record**« with the rotary knob and press to confirm.
  The »**record**« menu appears on the left-hand side.

Display (example):



Menu for configuration of list and printer entries.

Time
interval-started **(min)**
A list entry is activated after a fixed time interval in minutes.

NiBP-started
An entry is made after every NiBP measurement with new measured values. This entry can be read by an external Dräger monitor via the MEDIBUS interface.

Warning-started
An entry is made whenever an alarm is triggered.

Caution-started
An entry is made whenever a caution message is triggered.

- Turn the rotary knob to select the event triggering the entry and press to confirm.

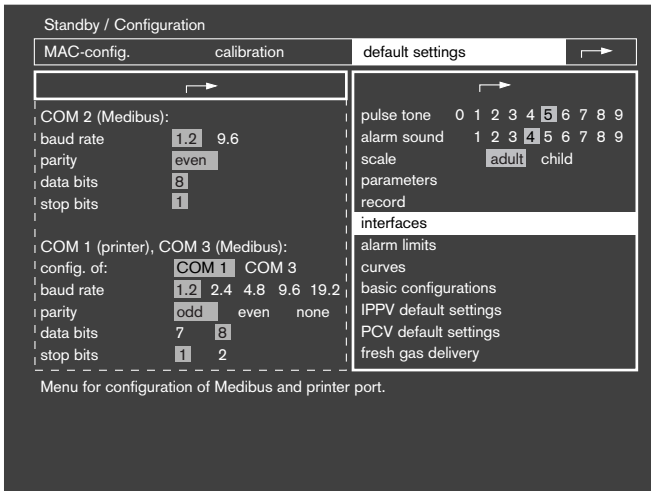
Configuring the interfaces

Julian has three serial interfaces:
COM1, COM2, COM3.
COM2 and COM3 are configured as MEDIBUS* interfaces and COM1 as printer interface. The interfaces can be adapted to the connected equipment.

- Turn the rotary knob to select the line »**interfaces**« and press to confirm.
  The »**interfaces**« menu appears in the left-hand field.

Display (example):

COM2 is configured in the upper half of the menu and COM1 and COM3 in the bottom half.



Menu for configuration of Medibus and printer port.

* MEDIBUS: Dräger communications protocol for medical equipment.

Interface
Choice between configuration of COM2 or COM3.

Baud rate
Transmission speed (variable, see Instructions for Use of the equipment to be connected).

Parity
This display is invariable for MEDIBUS and is shown only for information.

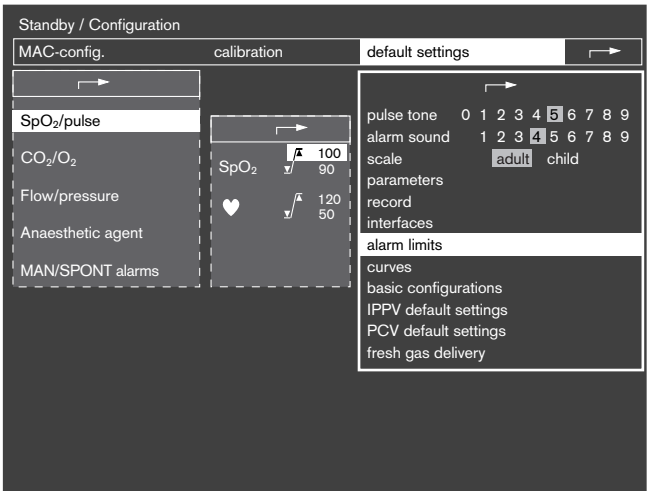
Data bits
This display is invariable for MEDIBUS and is shown only for information.

Stop bits
This display is invariable for MEDIBUS and is shown only for information.

Setting default alarm limits

- Turn the rotary knob to select the line »**alarm limits**« and press to confirm.
  The »**alarm limits**« menu appears in the left-hand field.

Display (example):



- Select required parameter by turning the rotary knob and press to confirm.
  The "alarm limits" menu appears.
- In the menu, select the required alarm limit by turning the rotary knob and press to confirm. The default alarm limit is highlighted against a white background.
- Set and confirm the value with the rotary knob. The value is then displayed in normal mode.
  The cursor bar jumps to the next default alarm limit.
- Set the next default alarm limit as described above.

The following alarm limits can be configured:

SpO2/pulse	SpO2	Pulse rate			
CO2/O2	etCO2	FiCO2	FiO2		
Flow/pressure	MV	PAW			
Anaesth. agent	Fi Iso.	Fi Hal.	Fi Sev.	Fi Enf.	Fi Des.
MAN/SPONT alarms	etCO2	FiCO2	FiO2	MV	

The etCO2 ↓↑, FiCO2 ↑, FiO2 ↑ and MV ↓↑ alarms can be configured »**ON**« or »**OFF**« in standby mode for the transition from MAN/SPONT. When the alarm limits are set to »**ON**«, the value is transferred from automatic ventilation mode.

Adjustment range for default alarm limits

Alarm limit	Adjustment range	Default value set on delivery
SpO_2 [%]	51 to 100 50 to 99	– – 92
Pulse ♥ [1/min]	31 to 300 30 to 299	120 50
$etCO_2$ [mmHg]	1 to 75 0 to 74	50 – –
$FiCO_2$ [mmHg]	0 to 10 – –	5 – –
MV [L/min]	0,1 to 39 0 to 38,9	12 3,0
FiO_2 [Vol.%]	19 to 100 18 to 99	– – 20
Fi Hal. [Vol.%]	0,1 to 7 0 to 6,9	1,5 – –
Fi Iso. [Vol.%]	0,1 to 7 0 to 6,9	2,3 – –
Fi Enf. [Vol.%]	0,1 to 7 0 to 6,9	3,4 – –
Fi Des. [Vol.%]	0,1 to 21,9 0 to 21,8	12,0 – –
Fi Sev. [Vol.%]	0,1 to 9,9 0 to 9,8	3,4 – –
PAW [mbar]	5 to 98 0 to 35	40 8

Fixed alarm times:

Apnoea pressure	after 15 seconds
Apnoea flow	after 15 seconds
Apnoea CO_2	after 15 seconds (after 60 seconds in MAN/SPONT)

– – : The default value set on delivery is outside the monitoring range and the corresponding alarm limit is therefore switched off.

The newly set default alarm limits are valid whenever the apparatus is switched on or started up from standby mode.

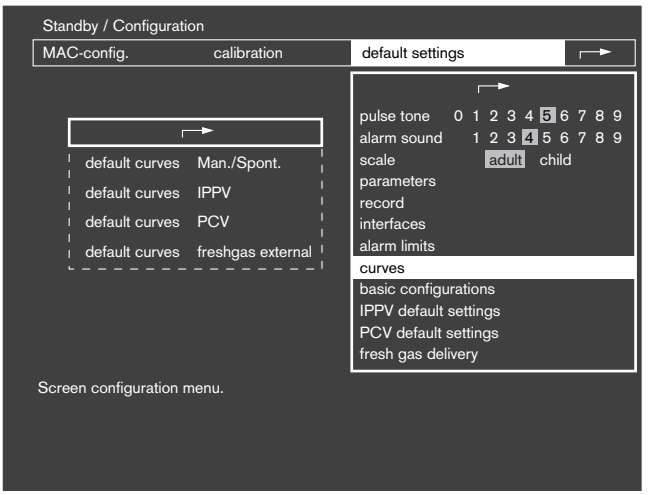
Certain alarm limits are switched off automatically in MAN/SPONT ventilation mode and when using the external fresh gas outlet:
see tables, alarm limits for MAN/SPONT, page 39
and alarm limits for non-rebreathing systems, page 51.

Configuring curves

Three standard curves can be configured for each of the ventilation modes: MAN/SPONT, IPPV, PCV and Fresh gas external.

- Turn the rotary knob to select the line »**curves**« and press to confirm.
  The selection menu appears in the left-hand field.

Display (example):

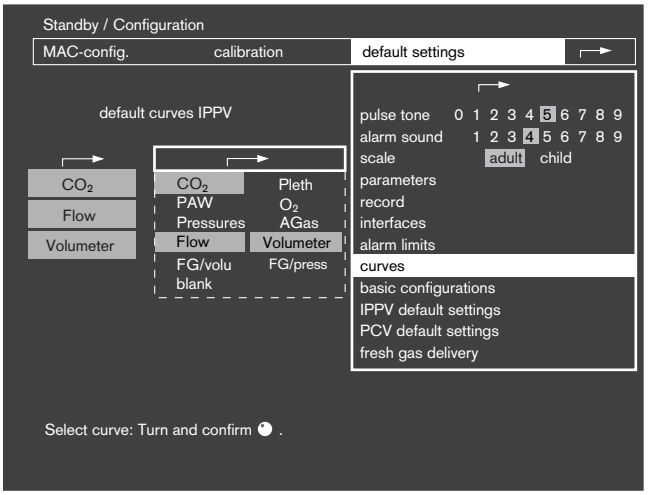


- Select the required ventilation mode with the rotary knob:

The »**Standard IPPV screen**« has been selected in the example:

The currently selected parameters appear in the left-hand field, followed by the selection menu with the curves which can be selected.

- Select the required parameter in the selection menu with the aid of the rotary knob and press to confirm.
  The parameter appears against a white background.
- Select and confirm the position of the new parameter with the rotary knob.
  The corresponding position remains unused if »**blank**« is selected.

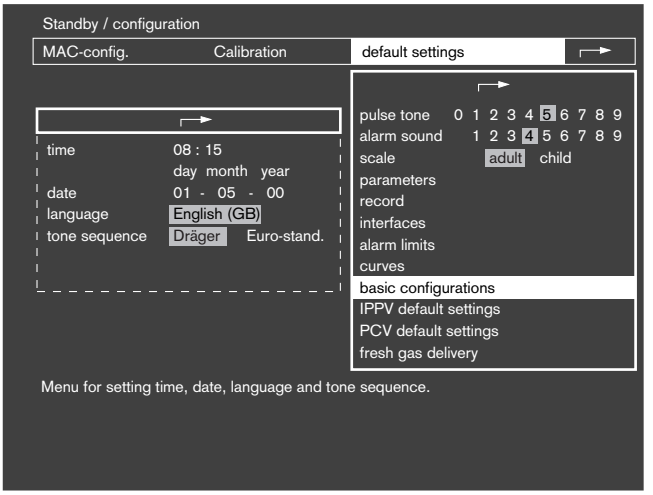


Setting basic configurations

for time, date, language and tone sequence.

- Turn the rotary knob to select the line »**basic configurations**« and press to confirm.
  The selection menu appears in the left-hand field.

Display (example):



Setting the date/time:

- Select and confirm the »**time**« line with the rotary knob.
  The cursor bar marks the hours.
- Press the rotary knob to confirm and the value is highlighted against a white background. It can now be adjusted and confirmed with the rotary knob.
  The minutes are adjusted and confirmed in the same way.
- Set and confirm the date as described above.

Setting the language of the display texts:

The last language selected is highlighted by a grey background.

The following alternatives can be selected:

English (**GB**)
French (**F**)
Italian (**I**)
Spanish (**E**)
Dutch (**NL**)
Danish (**DK**)
Norwegian (**N**)
Swedish (**SW**)
English (**US**)
Polish (**PL**)
Portuguese (**P**)
Japanese (**JA**)
Greek (**GR**)
Hungarian (**HU**)
Catalan (**CA**)
Turkish (**T**)
German (**D**)

To change the language setting:

- Turn the rotary knob to select the line »**language**« and press to confirm.
- Select and confirm the relevant country code with the rotary knob. The texts in the menu now appear in the language selected.

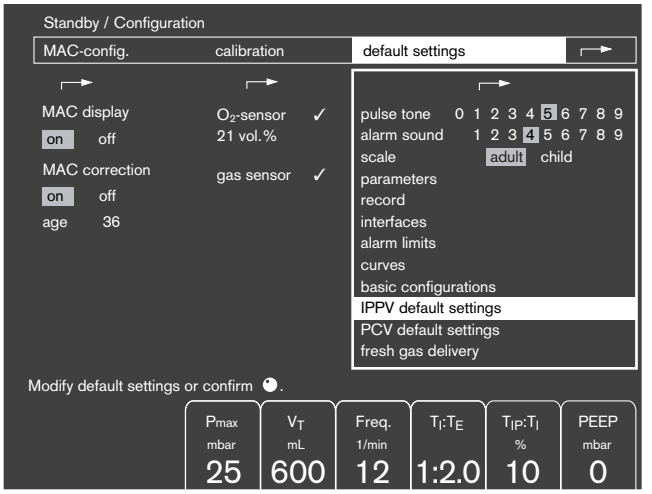
Setting the tone sequence:

- Turn the rotary knob to select the line »**tone sequence**« and press to confirm.
- Select and confirm either the Dräger alarm tone sequence or the standard European alarm tone sequence.

IPPV default settings

- Select and confirm the line »**IPPV default settings**« with the rotary knob.
  The softkeys for IPPV are displayed:

Display (example):



To modify the settings:

- Press the relevant softkey.
- Set and confirm with the rotary knob.

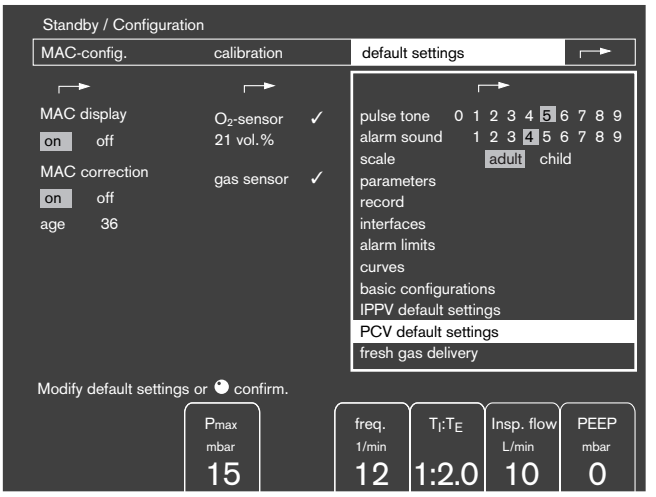
To return to the »**default settings**«:

- Press the rotary knob.

PCV default settings

- Select and confirm the line »**PCV default settings**« with the rotary knob.
  The softkeys for PCV are displayed:

Display (example):



To modify the settings*:

- Press the relevant softkey.
- Set and confirm with the rotary knob.

To return to the »**default settings**« menu:

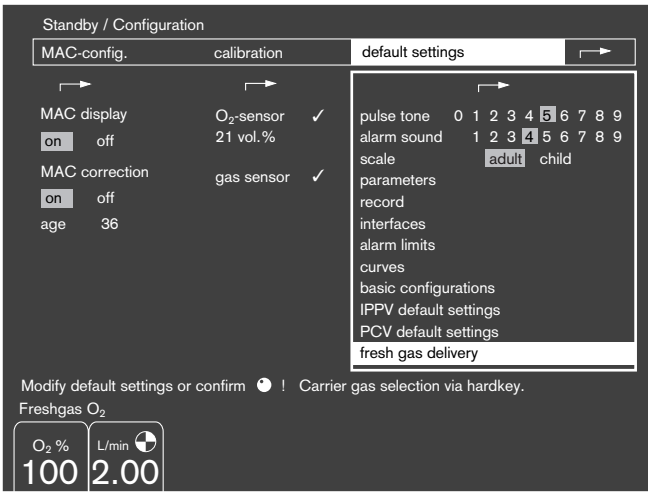
- Press the rotary knob.

* Maximum setting for Pmax: 30 mbar.

Setting the fresh gas default settings

- Select and confirm the line »**fresh gas default settings**« with the rotary knob. The softkeys for the fresh gas settings are displayed:

Display (example):



To modify the settings:

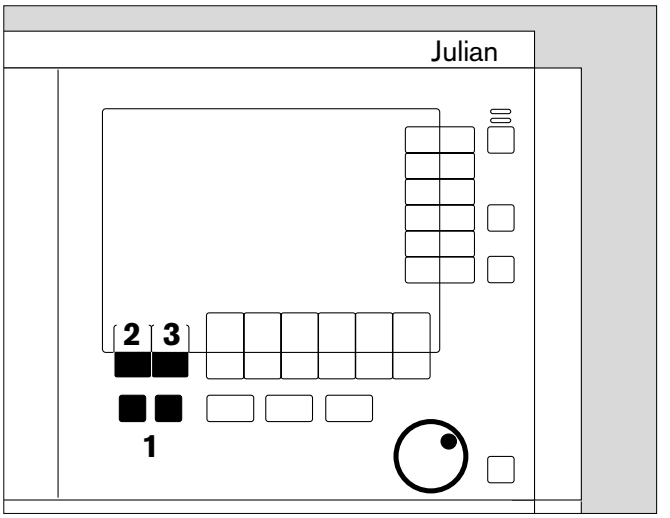
1 Press the keys »**N2O**« or »**Air**« to select the default carrier gas and press the rotary knob to confirm.

2 Press the softkey »**O2 %**«.

Set the default O2 concentration with the rotary knob and press to confirm.

3 Press the softkey »**L/min**«.

Set and confirm the default fresh gas flow with the rotary knob.

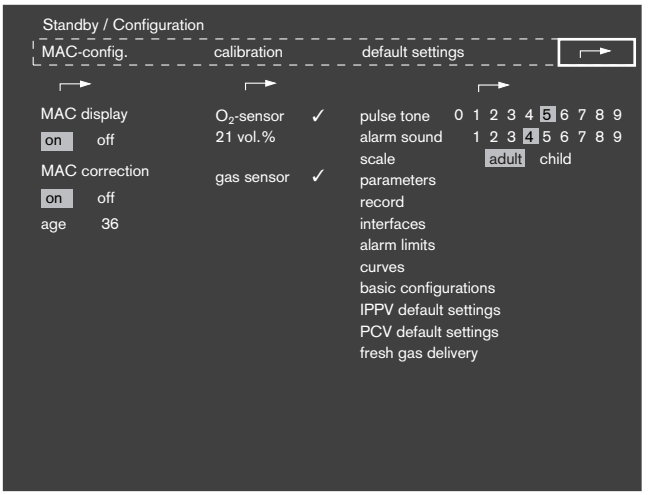


To return to the »**fresh gas default settings**« menu:

- Press the rotary knob.

Manual calibration

Julian calibrates its sensors automatically during operation. The message CAL appears instead of the current measured value during a calibration process.
Calibration of the O_2 sensor and zero calibration of the other gas sensors can be repeated manually, for instance if automatic calibration was unsuccessful.



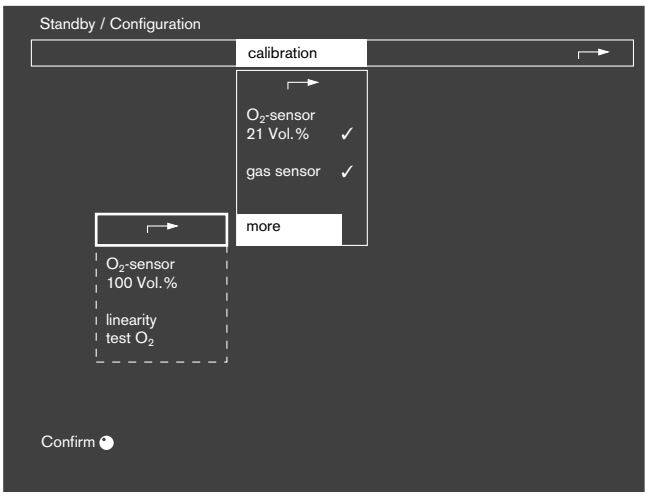
In standby / configuration mode:

- Turn the rotary knob to select the »**calibration**« column and press to confirm.
- Select and confirm the appropriate line with the rotary knob, for example:
  »**O_2-sensor**
  21 vol.%«

The calibration process is started when the selection is confirmed. The clock symbol ◷ appears after the relevant line, i.e. calibration is in progress.

When calibration is complete, a tick (✓) appears instead of the clock symbol. A question mark (**?**) indicates that calibration must be repeated because the previous calibration was defective.

To improve the measuring accuracy of high O_2 concentrations, an additional 100 vol% O_2 calibration and a linearity test of the O_2 sensor can be performed under the menu option »**more**«.



Other settings can already be made during the calibration process.

100 vol.% O_2 calibration

- Use a separate O_2 source, e.g. O_2 flowmeter.
  O_2 from the Julian breathing system is not suitable, as it still contains traces of anaesthetic gas.
- Unscrew the sample line from the Y-piece and place it in the continuous flow of the O_2 source.
- Turn the rotary knob to select the line
  »**O_2-sensor**
  100 vol.%«
  and press to confirm.
- Allow the O_2 flow to continue flowing into the sample line.

A tick (✓) appears after the field when calibration is complete.

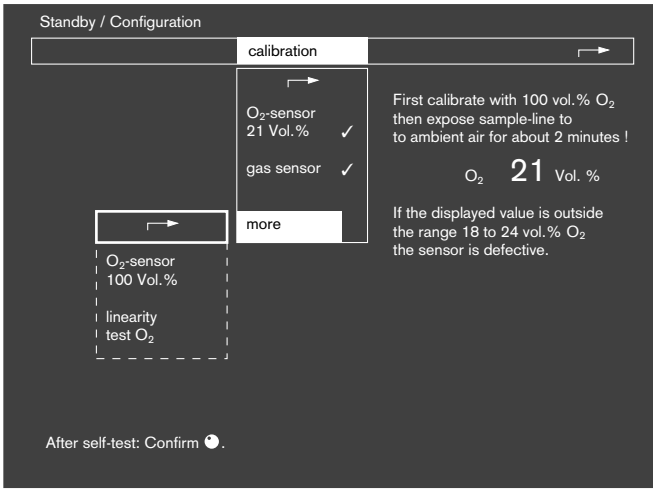
- Screw the sample line back on to the Y-piece.

O2 linearity test

- First perform the "100 vol.% O2 calibration". Then:
- Turn the rotary knob to select the line **»linearity test O2«** and press to confirm.

After approx. 20 seconds:

- Display (example): **O2 21 vol.%** A display in the range between 18 and 24 vol.% is correct. If the display is outside this range, the O2 sensor is defective or spent (replace O2 sensor, see page 119).



MAC configuration

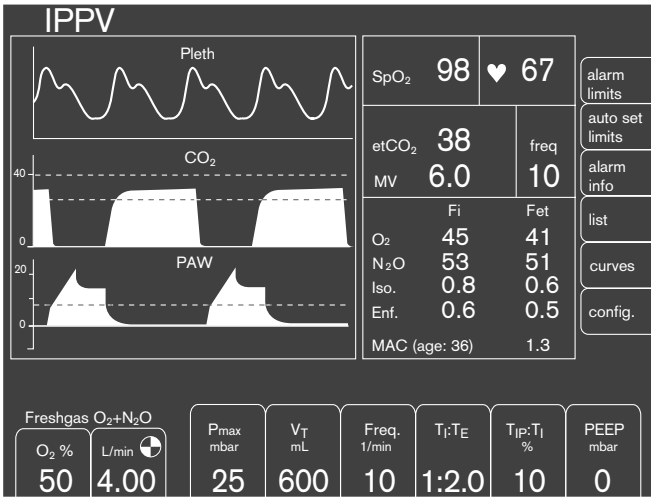
Anaesthetic agent identification and display

Julian automatically identifies the anaesthetic agent used and adjusts the measurement and monitoring of the anaesthetic gas concentration to suit the gas identified.

If there is a mixture of two volatile anaesthetic agents, the concentration of the secondary anaesthetic agent is displayed from a MAC value of 0.1 MAC upwards. The gas with the higher expiratory MAC value is displayed above the secondary gas.

A secondary anaesthetic agent becomes the main anaesthetic agent if its MAC value exceeds the MAC value of the main anaesthetic agent by 0.2 MAC.

A mixture of more than 2 volatile anaesthetic agents cannot be reliably detected.



Calculating the MAC values

Julian calculates the MAC value (Minimum Alveolar Concentration) from the linear total of volatile anaesthetic agents measured and N2O. The measured values used are the end-expiratory concentrations. Partial pressures are taken into account.

Age-corrected MAC values are calculated according to W. W. Mapleson, British Journal of Anaesthesia 1996, pp. 179-185.

Displaying MAC

To activate the MAC display:

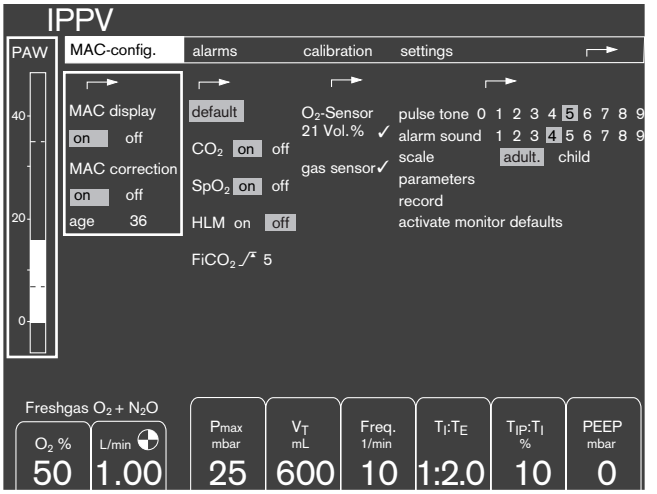
- Select column »**MAC config.**« by turning the rotary knob and press to confirm.
- Select line »**MAC display**« by turning the rotary knob and press to confirm.
- Select line »**On**« by turning the rotary knob and press to confirm.

To select the age correction for the MAC display:

- Select line »**MAC correction**« by turning the rotary knob and press to confirm.
- Select line »**On**« by turning rotary knob and press to confirm.

To select the patient's age:

- Select line »**Age**« by turning the rotary knob and press to confirm.
- Set age by turning the rotary knob and press to confirm.



If the MAC display is configured to »**Off**«, the »**MAC correction**« and »**Age**« lines are automatically dimmed.

If MAC correction is configured to »**Off**«, the »**Age**« line is automatically dimmed.

MAC-Definition:
1 MAC is equal to the anesthetic gas concentration at which 50% of all patients no longer respond to a stimulation of the nerves.
The influence of other medication(opiates or intravenous hypnotics) is not taken into consideration when calculating MAC values.

Care

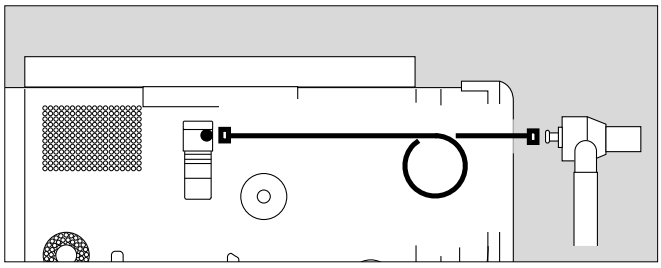
Contents

Care

Dismantling components

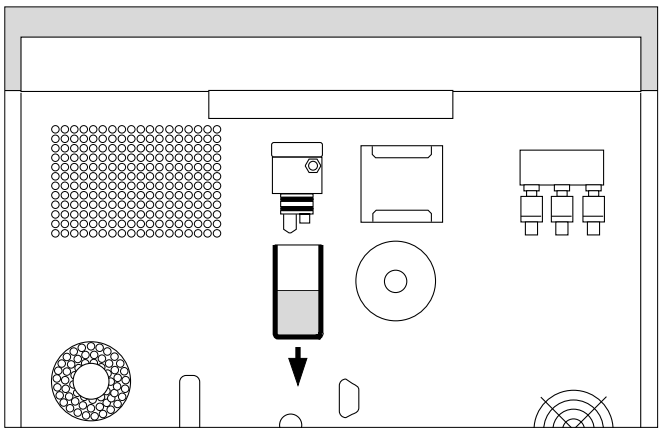
Dismantling sample line

- Unscrew the sample line from the Y-piece and water trap on the back of the unit.
  The sample line is not reusable and can be disposed of with ordinary domestic waste.



Removing water trap container

- Pull the container of the water trap down and off, and empty it.
  Note the hygiene regulations of the hospital!
- Prepare the container of the water trap for disinfection and cleaning in a washing machine.

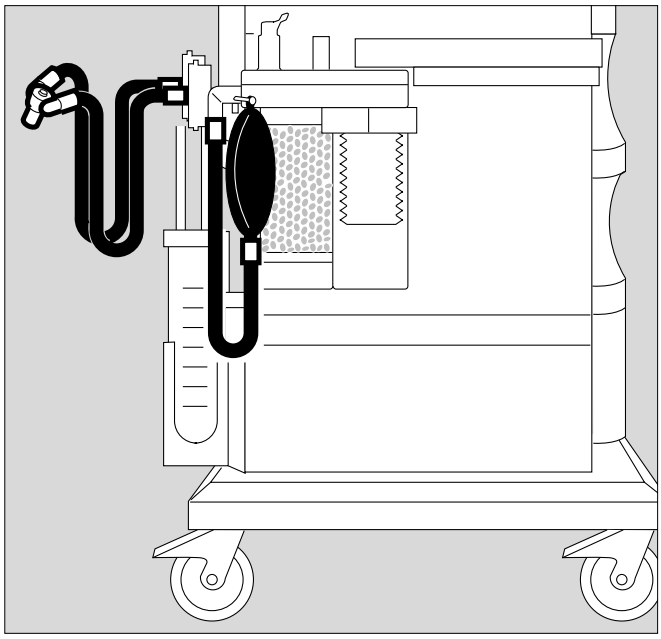


When using the "Waterlock" water trap

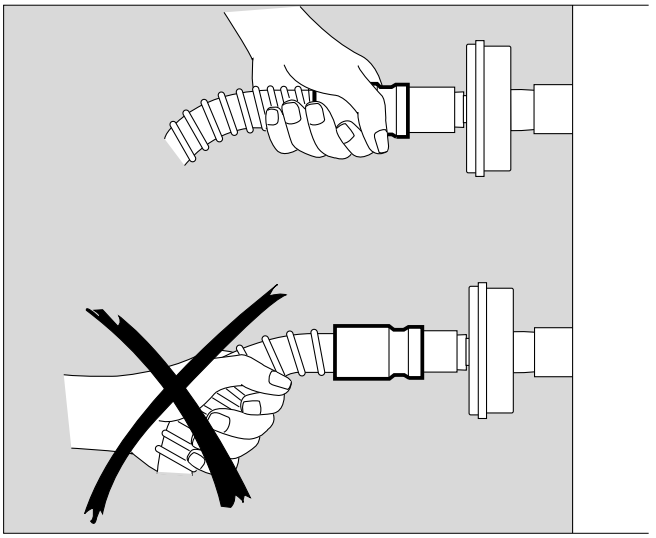
- See separate Instructions for Use.

Removing breathing hoses

- Remove the breathing hoses and breathing bag.
- Dismantle Y-piece and connector.
- Prepare the breathing hoses, breathing bag and Y-piece for disinfection and cleaning in a washing machine.



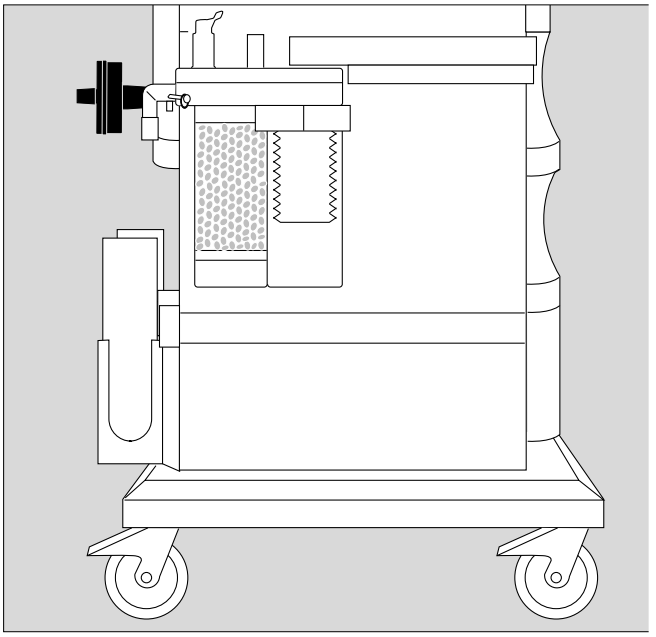
- Do not damage the breathing hoses!
  Always hold the hoses by the connection sleeve and not by the spiral ribbing when removing and connecting the breathing hoses, otherwise the spiral ribbing may be torn off the sleeve.
  Breathing hoses with damaged spiral ribbing can easily be kinked and interrupt ventilation!
  Always check the breathing hoses for damage prior to use.
  Damaged breathing hoses must not be used.



Removing microbial filters

On the sleeve of the microbial filter:

- Press together the surfaces marked »**PRESS**« and pull the filter off the connection at the same time. Do not use force, otherwise the sleeve may be damaged.
- Prepare the microbial filter for conditioning in accordance with the separate Instructions for Use.

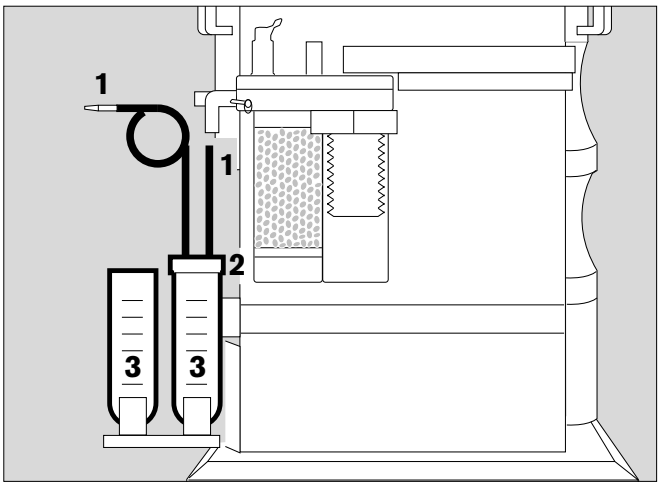


Dismantling the suction system

1 Remove the suction hose and vacuum hose.

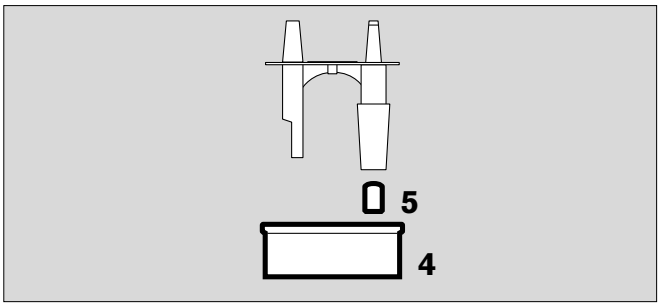
2 Grip the silicone sleeve of the bottle cap and pull it off.

3 Remove the secretion collecting bottle and flushing bottle from the bracket and empty them.
Note the hygiene regulations of the hospital.



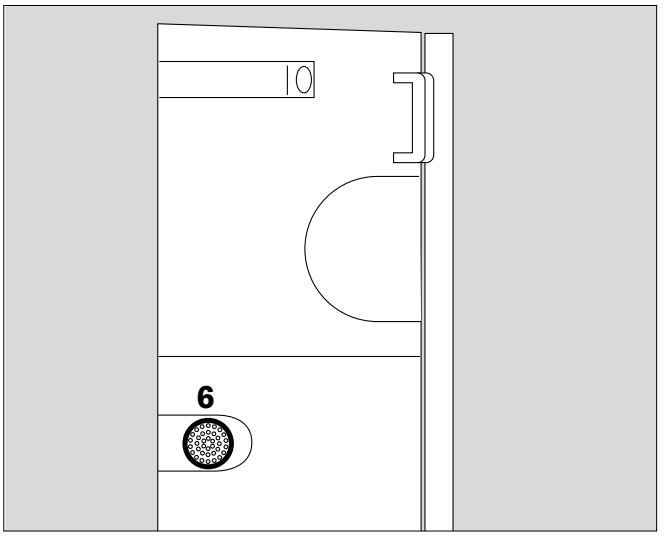
4 Remove the silicone sleeve from the lid of the secretion collecting bottle.

5 Remove the overflow protection float from the rising pipe.
Store the parts together for disinfection and cleaning in a washing machine.



6 Replace the bacterial filter in the side panel of the Julian – if soaked through or if contamination is suspected.
The filter must be replaced at the latest every two weeks.

- The bacterial filter must be disposed of as infectious special waste. It can be incinerated with little pollution at temperatures of more than 800 °C.

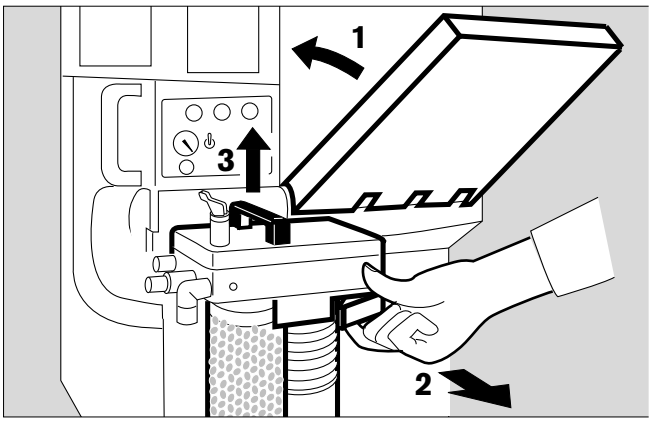


Dismantling the breathing system

1 Fold up the writing top.

2 Pull the catch and at the same time pull out the slot-in module.

3 Hold breathing system by the handle and pull upwards to remove.



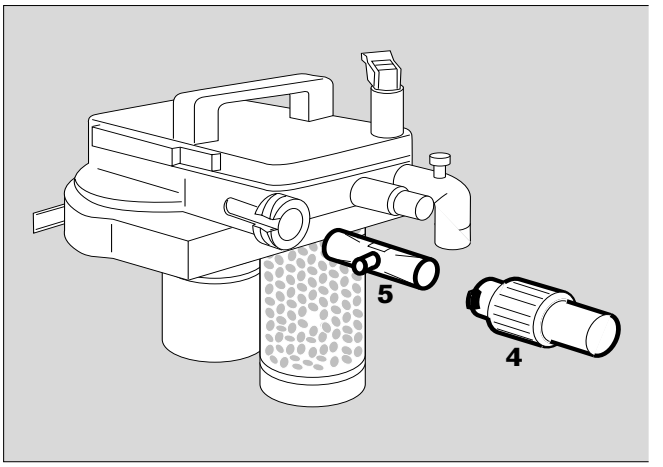
Removing the flow sensor

4 Unscrew the expiration port.

5 Remove the flow sensor.

The flow sensor cannot be disinfected / cleaned in a washing machine, nor can it be sterilized in high-temperature steam.

- The flow sensor must be disinfected in 70 % ethanol solution for approx. 1 hour.
  Leave the sensor to dry in air for at least 30 minutes, otherwise the remaining alcohol can damage the sensor when calibrated.
- The flow sensor can be reused as long as it can be calibrated successfully.



Removing the absorber and bellows

6 Turn the absorber counterclockwise and pull it downwards.

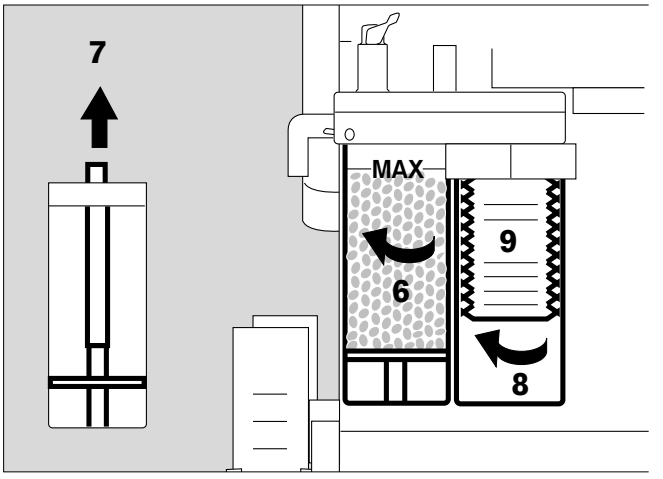
- Empty the soda lime; it can be disposed of with ordinary domestic waste.

7 Remove the insert from the absorber.

8 Turn the container of the bellows counterclockwise and pull it downwards.

9 Remove the bellows.

- Prepare the absorber, container of the bellows and the bellows for disinfection and cleaning in a washing machine.

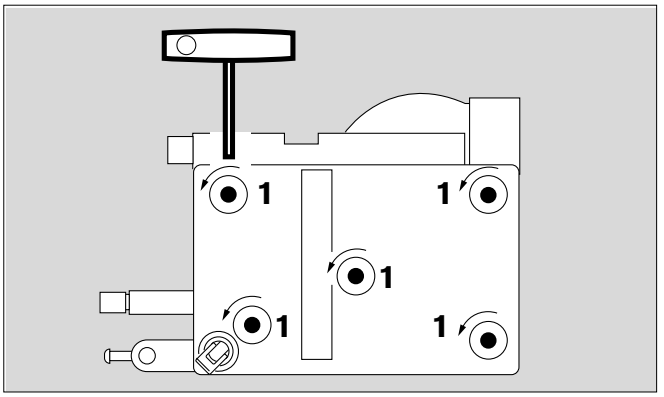


Opening the breathing system

– Weekly

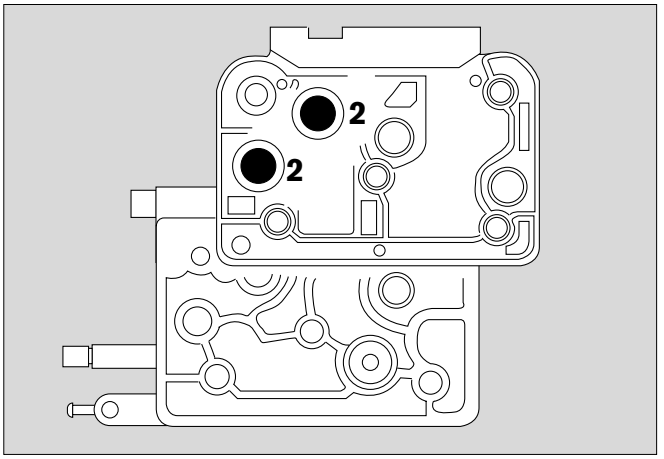
1 Loosen the five sealing screws a quarter-turn with the key supplied.

- Remove the cover.



2 Remove the two white ceramic valve discs.

- Lift off the metal valve plate.
- Keep the valve discs in a cassette to protect them against damage and prepare them for disinfection and cleaning in a washing machine.
- Prepare the housing parts for disinfection and cleaning in a washing machine.



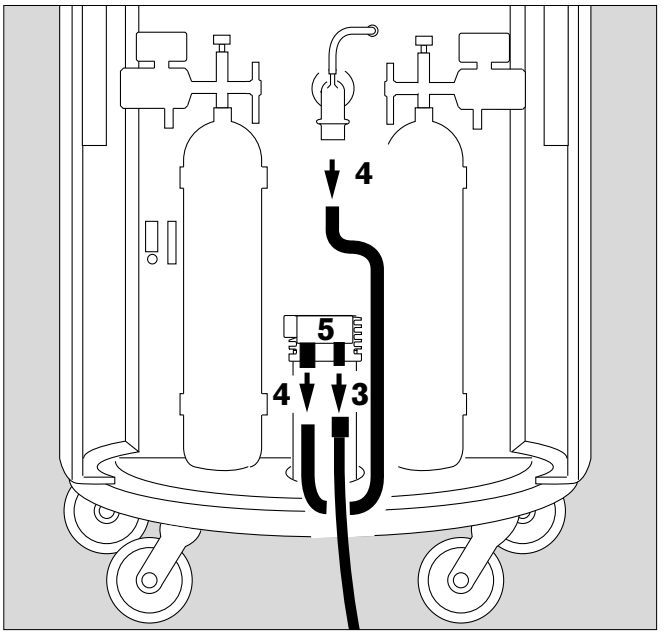
Dismantle the anaesthetic gas scavenging system AGS

3 Remove the scavenging hose.

4 Remove the transfer hose.

5 Remove the anaesthetic gas scavenging system.

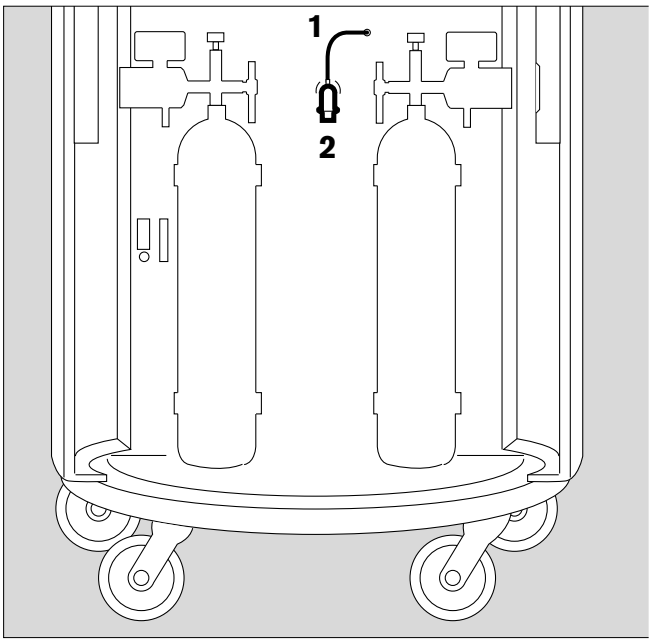
- Prepare the individual parts for disinfection and cleaning in a washing machine.



Removing waste gas connector

1 Pull hose off connector.

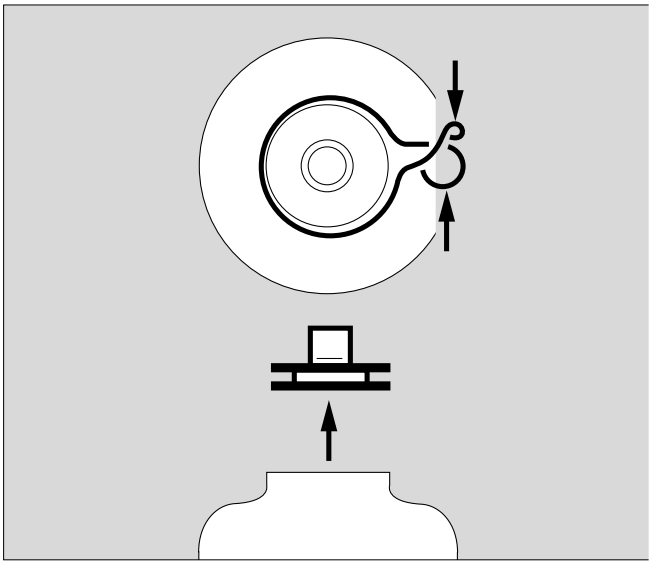
2 Remove waste gas connector completely.



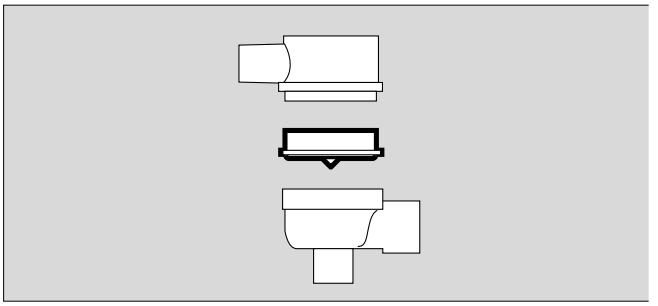
Dismantling emergency ventilation bag

Example: Dräger Resutator 2000

- Disconnect the mask or ventilation tube from the patient valve.
- Pull the patient valve out of the bag.
- Compress the retaining ring on the bag completely and remove it.
- Pull the adapter out of the bag.



- Unscrew the bottom part of the valve and remove the diaphragm.
  The small diaphragm must remain in the upper part of the valve
- Prepare the individual parts for disinfection and cleaning in a washing machine.



Disinfecting / cleaning / sterilizing

Only products from the list of surface disinfectants may be used for disinfection. To ensure material compatiblity, products based on the following agents may be used:

– Aldehydes
– Alcohols
– Quaternary ammonium compounds.

The following products are not suitable:

– Compounds containing alkylamines
– Compounds containing phenols
– Halogen-releasing compounds
– Strong organic acids
– Oxygen-releasing compounds.

Users in the Federal Republic of Germany are advised to use disinfectants specified in the current list published by the German Society for Hygiene and Microbiology (DGHM). The DGHM list also specifies the active agent of each disinfectant.
Users in countries in which the DGHM list is not available are advised to use the agents mentioned above.

Alcohols and agents containing alcohol must not be allowed to seep into the sample line!
Alcohol can distort the measurement results.

Breathing system

All parts of the breathing system, valve discs, bellows, bellows container, Y-piece, breathing hoses, water trap containers, breathing bag, parts of the absorber and Resutator 2000, parts of the secretion aspirator and parts of the anaesthetic gas scavenging system

- Disinfect in hot liquid disinfectant – in a disinfecting machine at 93 °C for 10 minutes.
  Only use cleaning agent, no alkaline or chlorine-releasing substances – risk of corrosion!

All parts of the breathing system (except the flow sensor!), Y-piece, breathing hoses, water trap containers, breathing bag, parts of the absorber, parts of the secretion aspirator and parts of the anaesthetic gas scavenging system

- can be sterilized in hot steam at 134 °C.

Surfaces of Julian, compressed gas hoses, cables and Vapor 19.3 / Vapor 2000 / Devapor

The surface of the apparatus must not be treated with agents containing alcohol.

- Wipe off impurities with a damp disposable cloth.
- Disinfect with a wipe-on disinfectant, e.g.
  Buraton 10 F
  (made by Schülke & Mayr GmbH).
  Note the manufacturer's Instructions for Use.
  Do not allow any liquids to enter openings in the apparatus.

Flow-Sensor

- Disinfect for approx. 1 hour in 70 % ethanol solution. Leave the sensor to dry in air for at least 30 minutes, otherwise the remaining alcohol can damage the sensor when calibrated.
  The flow sensor cannot be autoclaved.
- The flow sensor can be reused as long as it can be calibrated successfully.
- The flow sensor must be disposed of as infectious special waste. It can be incinerated with little pollution at temperatures of more than 800 °C.

Microbial filter 654 St

- Wipe the surface with a disposable cloth.

Do not clean with solvents such as naphtha, alcohol or ether.
Do not clean the filter in cleaning and disinfecting machines.
Do not immerse the filter in disinfectant solution.

- Sterilize the filter at max. 134 °C in a hot steam sterilizer.
  Do not use ethylene oxide sterilization!
  Do not sterilize when connected!
- Mark each sterilization in the corresponding field on the filter housing (e.g. with a water-resistant pen).

The filter can be sterilized up to 24 times.

The filter must be discarded:

– if the pressure rise in the resistance test is greater than 2 mbar.

– after being sterilized 24 times at the most.

- The filter must be sterilized once more in hot steam at 134 °C after use and can then be disposed of as plastic with ordinary domestic waste.
  Note the hygiene regulations of the hospital.

All the components are listed in the care list for Juian on pages 106 and 107, together with the corresponding intervals and appropriate means.

Care list for Julian anaesthetic workstation

Only applies for non-infectious patients.

When used with infectious patients, all parts in contact with breathing gas must additionally be sterilized after disinfection and cleaning.

What Components which can be conditioned	How often Conditioning intervals[1]		
	Filter on Y-piece	Filter on inspiration and expiration port	Without filter
Julian workstation	Front daily, other surfaces weekly		
Vapor 19.3 / Devapor unit	Daily		
Power cable, compressed gas hoses, equipotential bonding lead	Monthly		
Breathing bag with twin connector and hose	Daily	Daily	Per patient
Breathing hoses	Daily	Per patient	Per patient
Bellows	Weekly	Weekly	Daily
Y-piece	Daily	Per patient	Per patient
Cover of breathing system with APL valve	Weekly	Weekly	Daily
Middle and bottom part of breathing system	Weekly	Weekly	Daily
Container of bellows	Weekly	Weekly	Weekly
Valve discs (use a cassette)	Weekly	Weekly	Daily
Expiration port	Weekly	Weekly	Daily
Absorber and insert	Weekly	Weekly	Daily
Water trap (monitoring)	Daily	Daily	Daily
Microbial filter 654 St	—	Daily	—
Filter of the measured gas recirculation system	Weekly	Weekly	Weekly
Flow sensor	Weekly	Weekly	Daily
AGS housing	Weekly		
AGS flow tube (without filter)	Weekly		
Container for AGS buffer volume	Weekly		
AGS transfer hose	Weekly		
Scavenging hose with connector	Monthly		
Waste gas connector with tube	Weekly		
Hose of sample gas return or hose of sample gas scavenging	Weekly		
Emergency breathing bag, its diaphragm, upper and lower valve parts (Dräger Resutator 2000)	After each use		
Silicone sleeve of secretion collecting bottle and rinsing bottle, their lid with float, suction hose and inspection window	As required, but at least daily		

[1] The conditioning intervals depend on the use and position of the filters. The table is merely intended as a rough guide. The instructions of the hospital's hygiene officer shall prevail!

The parts should preferably be cleaned and disinfected in a washing machine, otherwise by immersion.

Julian and its components must not be treated with formaldehyde vapours or ethylene oxide!

	How			
	Disinfection and cleaning[4]			Sterilization
	Washing machine[2] 93 °C 10 minutes	Wiping[3]	Immersion[3]	Steam, 134 °C, 10 minutes
	no	outside	no	no
	no	outside	no	no
	no	yes	no	no
	yes	no	possible	yes
	yes	no	possible	yes
	yes	no	possible	yes, max. 25 times
	yes	no	possible	yes
	yes	no	possible	yes
	yes	no	possible	yes
	yes	no	possible	yes
	yes	no	possible	yes
	yes	no	possible	yes
	yes	no	possible	yes
	yes	no	possible	yes
	no	outside[4]	no	yes, max. 24 times
	no	outside	no	yes, max. 10 times
	no	outside	possible [5]	no
	yes	no	possible	no
	no	yes	no	no
	yes	no	possible	yes
	yes	no	possible	no
	yes	no	possible	no
	yes	no	possible	no
	yes	no	possible	yes
	yes	no	possible	yes
	yes	no	possible	yes

[2] Only use cleaning agents, no alkaline or chlorine-releasing substances. Risk of corrosion!

[3] Surface disinfectants based on aldehydes, alcohols and quaternary ammonium compounds, such as PaMo dur rapid or PaMo sept (Dräger Parts&More GmbH) can be used to ensure compatibility.

[4] Do not use any agents containing alcohol.

[5] Disinfect the flow sensor in 70% ethanol solution for approx. 1 hour and leave to dry in air for at least 30 minutes.

Assembling

Installing the breathing system

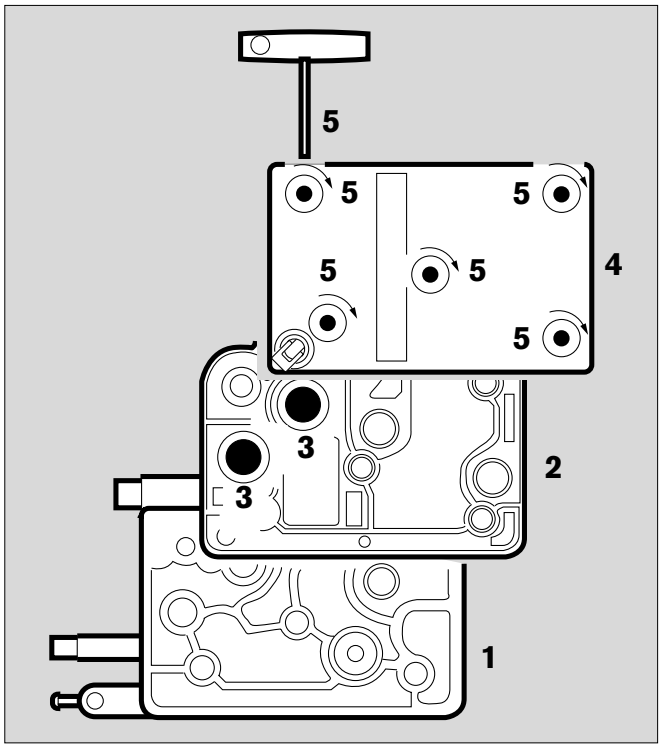
1 Place the bottom section on a flat surface.

2 Fit the valve plate on the bottom section.

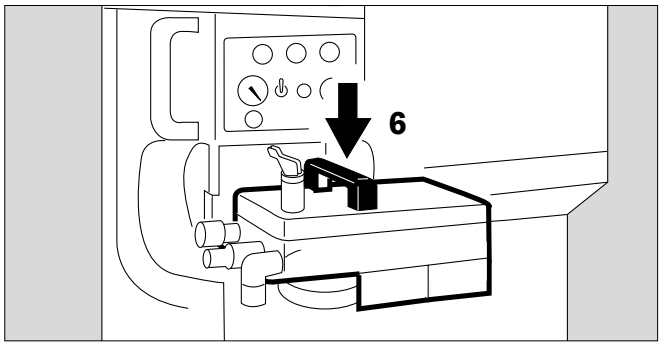
3 Insert both white ceramic valve discs.

4 Tightly fit the cover.

5 Tighten all five sealing screws a quarter-turn.



6 Hang the breathing system into the slot-in unit.

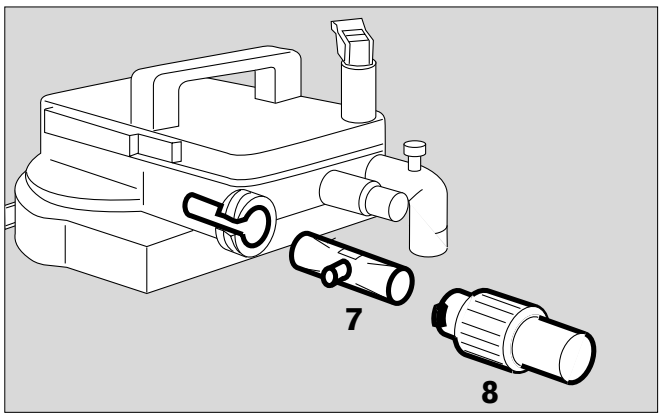


Inserting the flow sensor

7 Insert the flow sensor with the electric connection in the slot.

8 Push in the expiration port with the nose of the port in the slot.

- Tighten the knurled nut by hand.

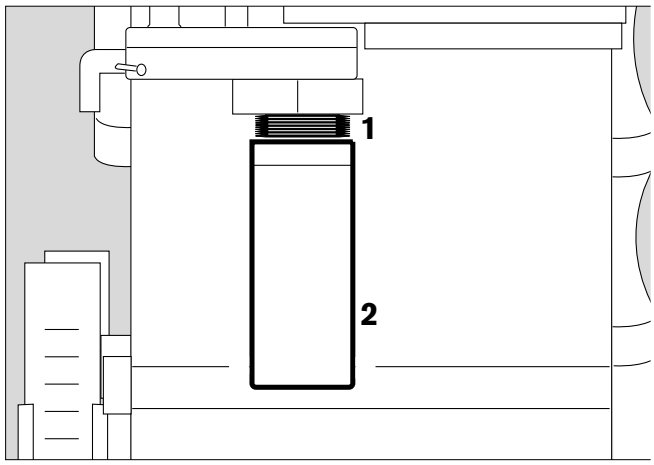


Installing the bellows

- Hold the breathing system from above to prevent it dropping out and

1 uniformly slide the tightly compressed bellows onto the connector.

2 Insert the container in the breathing system from below and turn it clockwise as far as possible.



Filling and installing the absorber

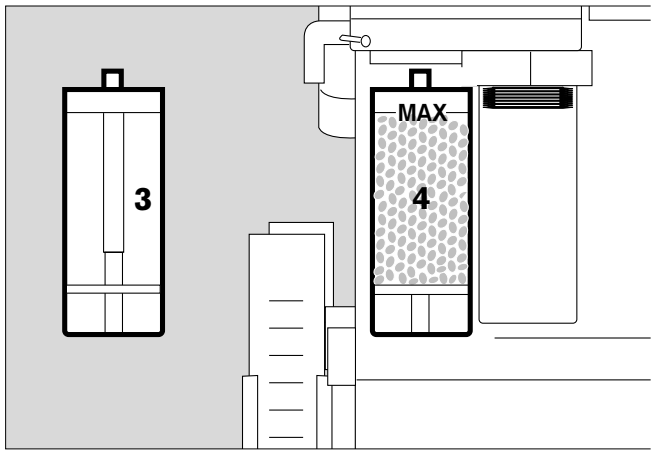
3 Push the insert fully into the absorber.

- Fill the absorber with fresh soda lime – up to the MAX mark. Only use Drägersorb 800!

If the breathing system is to remain unused during the next 24 hours:

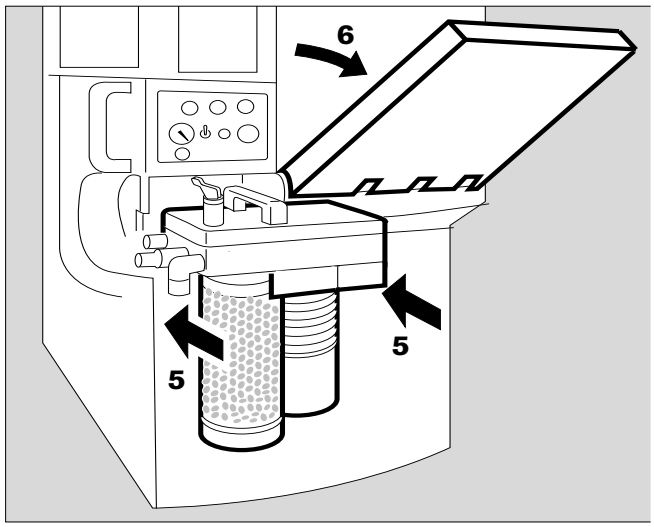
- Only fill with soda lime immediately before use! Soda lime dries out when exposed to ambient air and sun for a longer period of time. This reduces the CO_2 absorption capacity and the effectiveness of the indicator.

4 Insert the absorber in the breathing system from below and turn clockwise as far as possible.



5 Slot in the breathing system – as far as possible.

6 Fold down the writing top.



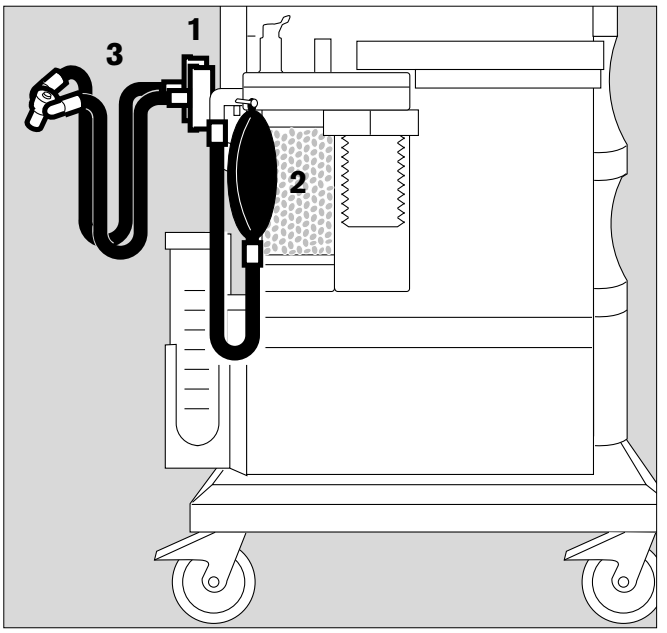
Installing the breathing hoses

1 Fit the microbial filters on the inspiration and expiration ports of the breathing system until they audibly engage.

2 Connect the 2.3 L breathing bag to the breathing hose with a connecting sleeve. Plug the breathing hose onto the angled connector and hang the breathing bag on the hook.

3 Plug the breathing hoses into the microbial filters and connect them to the Y-piece.

- **Do not use antistatic or conductive breathing hoses!**
  Fire hazard when using HF electrosurgery.



Julian has no components containing latex.
For latex-free use:

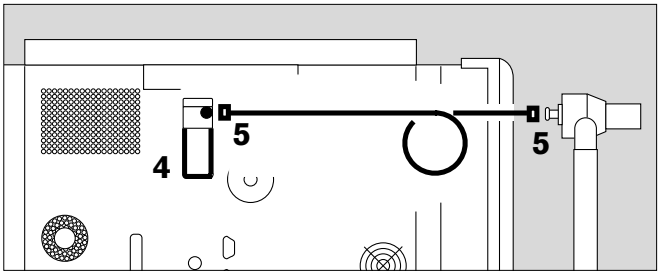
- **Use latex-free breathing bag and breathing hoses.**

4 Fit the water trap container from underneath.

5 Screw the sample line onto the Y-piece and water trap.

Only use original sample line. Other lines may change the technical data of the device.

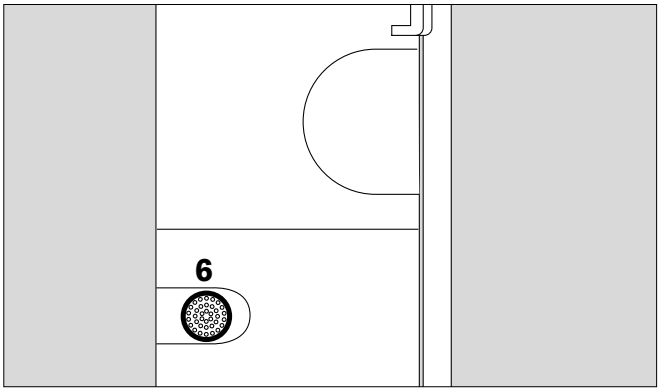
Alcohol and agents containing alcohol must not be allowed to penetrate the sample line!
Alcohol distorts the results of the concentration measurement.



Preparing the suction system

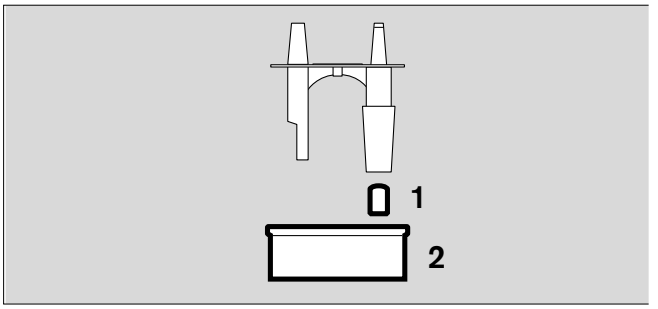
6 Plug the bacterial filter into the port on the side panel of the Julian.

- Replace the bacterial filter every two weeks.
- The filter must be disposed of as infectious special waste. It can be incinerated with little pollution at temperatures of more than 800 °C.



1 Press the overflow protection float into the rising pipe until it clicks into place. The float must move freely without falling out.

2 Uniformly button the silicone sleeve onto the cover.

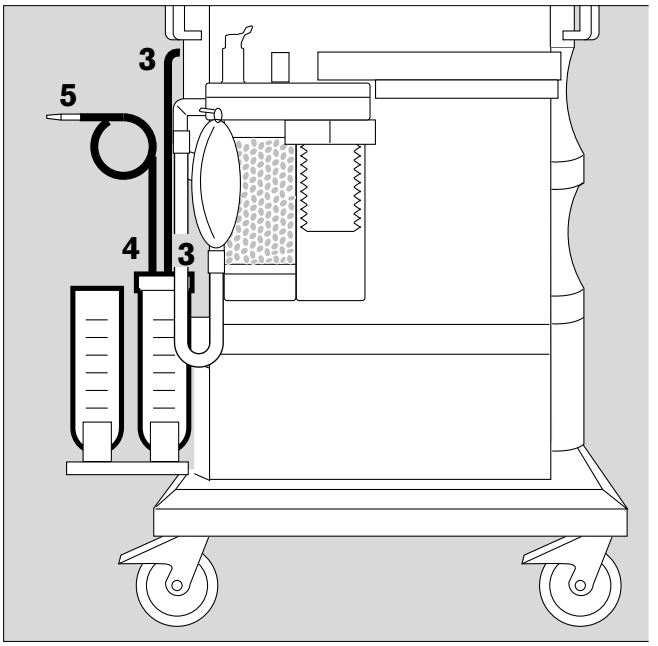


- Connect the bottle cap to the secretion collecting bottles.
- Place the secretion collecting bottle in the inner sleeve and the rinsing bottle in the outer sleeve.

3 Fit the vacuum hose to the port on the Julian and to the thin port on the cap.

4 Fit the suction hose to the thick port on the cap.

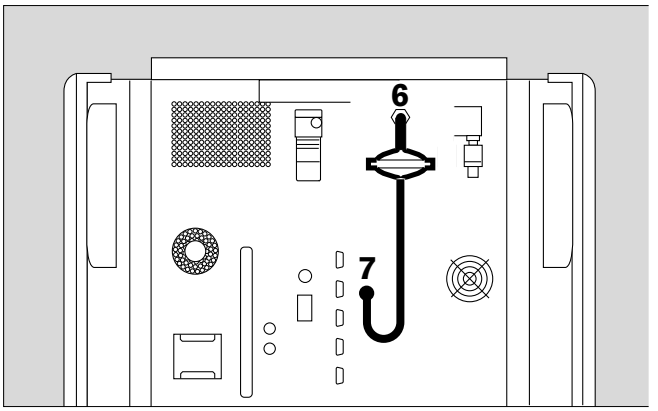
5 Fit the secretion inspection window in the suction hose.



Connecting the measured gas recirculation system

6 Fit the short hose to the port of the measured gas outlet.

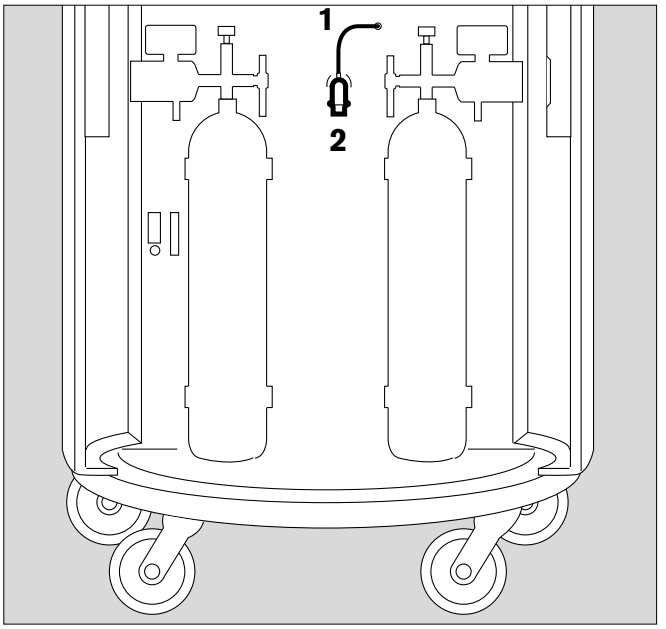
7 Fit the long hose to the port of the recirculation system.



Fitting waste gas connector

1 Push waste gas connector into the aperture all the way to the stop, angle downwards.

2 Fit hose to connector.



Sample gas scavenging

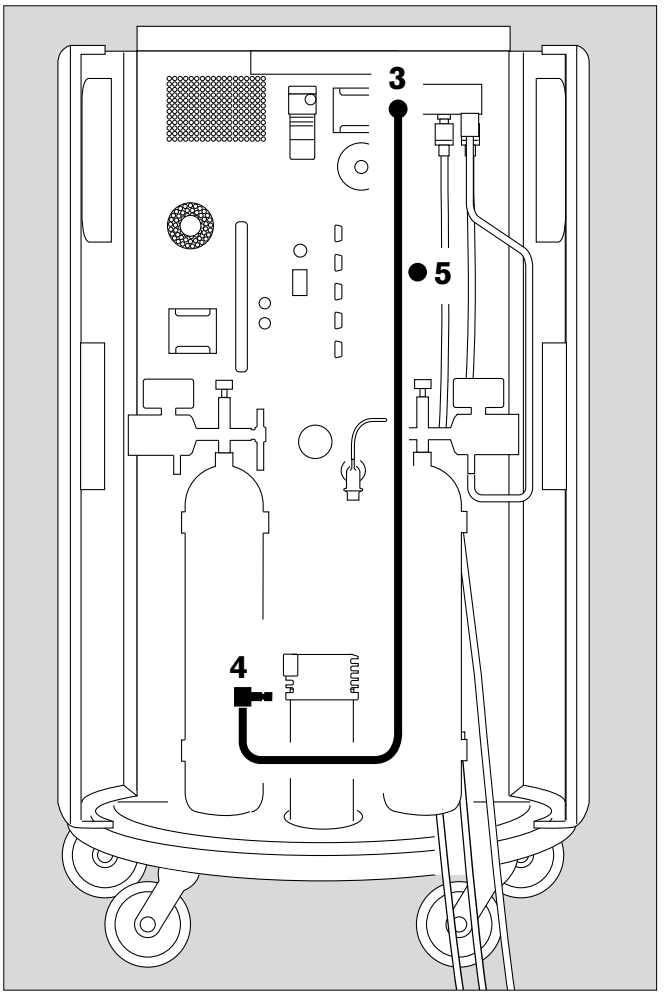
If the sample gas is not to be recirculated:

- Use hose 11 90 520, connector M 33 151 and sealing cap (optional).

3 Connect the hose to the port of the sample gas outlet port.

4 Fit the connector with sleeve to the free end of the hose.
Insert the connector in the coupling of the anaesthetic gas scavenging system until it clicks into place.

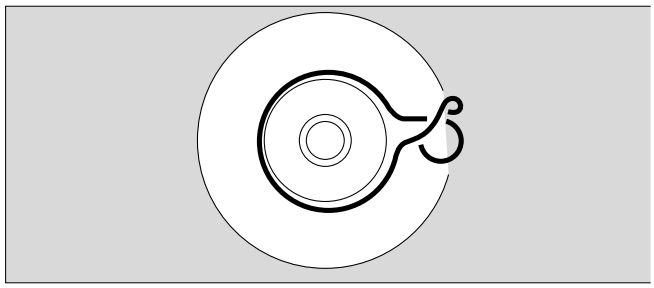
5 Fit the cap to seal the port.



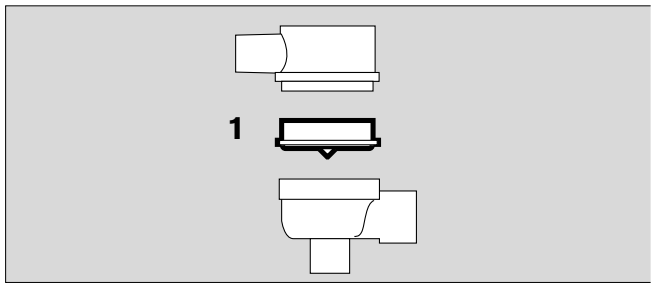
Fitting emergency ventilation bag

Example: Dräger Resutator 2000

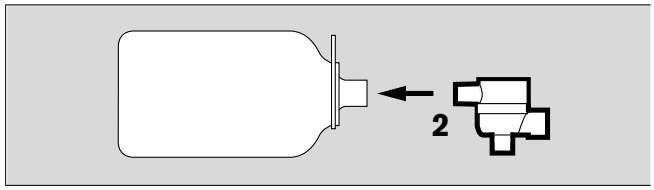
- Insert the adapter in the bag so that the rubber flange is uniformly located in the groove of the adapter.
- Press the retaining ring together completely with the large eyelet pointing towards the bag and clamp it over the bead on the bag.



1 Place the diaphragm in the bottom part of the valve with the lip facing downwards.
Screw the upper part of the valve onto the bottom part.



2 Plug the patient valve into the bag adapter.



Connecting the anaesthetic gas scavenging system AGS

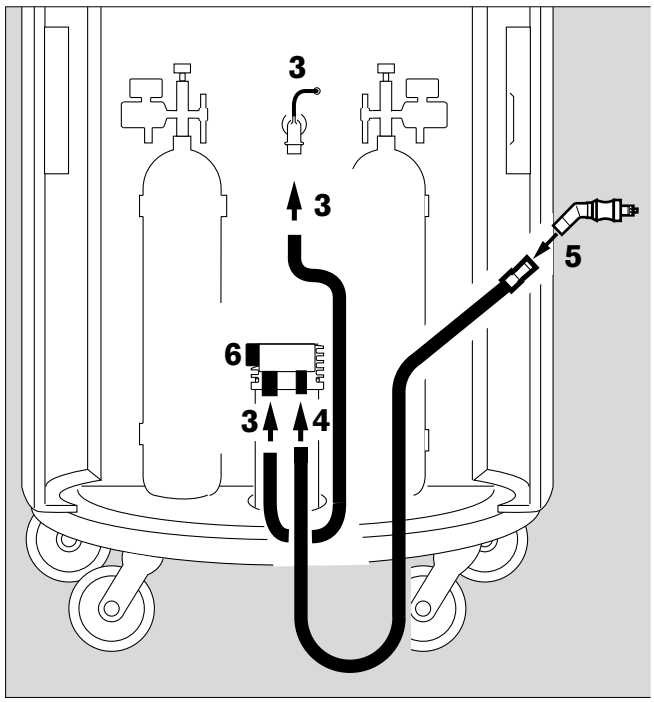
3 Connect the transfer hose to the excess gas connector and to the port of the scavenging system.

4 Connect the suction hose to the port of the scavenging system.

5 Connect the anaesthetic waste gas connector to the suction hose.

6 Ensure that the second port on the scavenging system is sealed with the sealing screw.

- Note the Instructions for Use of the anaesthetic gas scavenging system AGS.



Julian as Wall-mounted Unit

Contents

Julian as Wall-mounted Unit

Features

The wall-mounted unit is fixed to the wall and is available in left or right-hand hinged versions.

The supply lines are permanently connected to the wall-mounted unit.

The auxiliary power sockets and the grounding pins for earth leads are located on the left and right sides of the lower half of the unit.

The AGS anaesthetic gas scavenging line is built into the unit.

The on/off switch and display symbols for anaesthetic gas aspiration are located in the lower half of the unit.

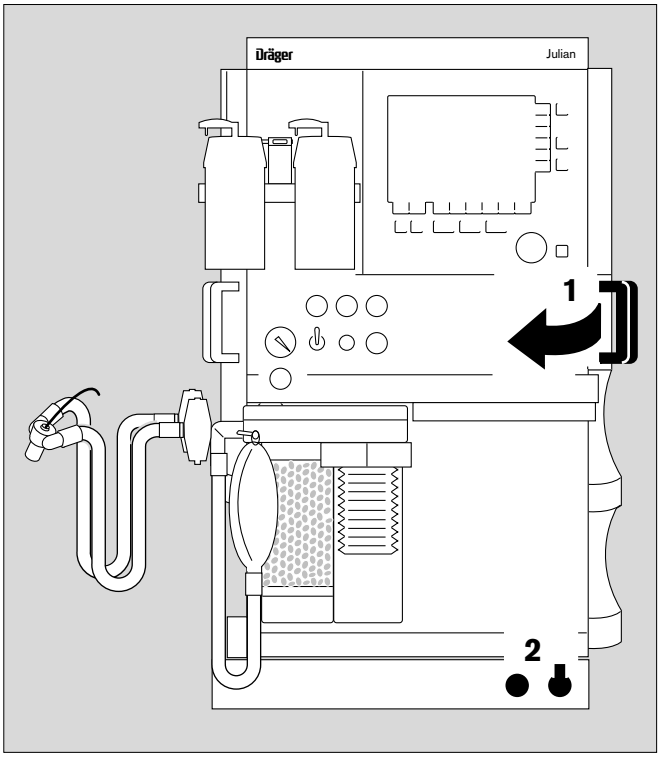
The bacterial filter for secretion aspiration is located on the left side of the unit.

The wall-mounted unit must be installed by qualified personnel only.
We recommend DrägerService.

Preparation

Julian can be swung clear of the wall on its hinges to gain access to the back panel.

1 Pull the handle to swing the unit about 30° clear of the wall.



- Connect the sampling line for anaesthetic gas measurement to the back panel.

After connecting the sample line:

- Swing the unit back against the wall until it latches into place.
- Pull gently to check that Julian is fixed to the wall.
- Always return the device to the wall position in order to save space and avoid damage.

Anaesthetic gas aspiration

2 Switch on = switch pointing upwards, symbol lights up green.

Switch off = switch pointing downwards, symbol unlit.

Operation and Care as per standard Julian model.

Maintenance Intervals

Contents

Maintenance Intervals

The workstation and its components must be cleaned and disinfected before every maintenance operation - even when returning for repair!

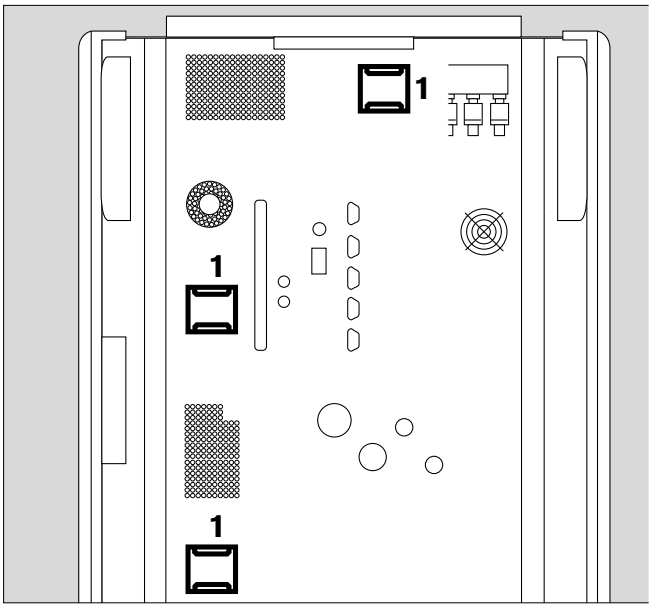
Water separator	Replace when dirty or when the message **CO2 line?!** is displayed (if the sample line is correctly installed and free of any blockage). Can be disposed of as domestic waste.
O_2 sensor	Replace when calibration is no longer possible or when the message **FIO2 INOP!** is displayed. Disposal, see page 120.
Flow sensor	Replace when calibration is no longer possible or when the message **FLOW INOP!** is displayed. Can be incinerated with little pollution at temperatures of more than 800 °C.
Bacterial filter for secretion aspiration	Replace after two weeks. Must be disposed of as infectious special waste. Can be incinerated with little pollution at temperatures of more than 800 °C.
Bacterial filter for measured gas recirculation	Replace every six months. Can be incinerated with little pollution at temperatures of more than 800 °C.
Cooling air filter (set of 3)	Should be cleaned and thoroughly dried or replaced every month. Must be replaced after one year at the latest. Can be disposed of as domestic waste.
Lithium battery for data backup (set of 2)	Must be replaced by professionals after two years. Must be disposed of in accordance with local waste disposal regulations.
Lead gel battery in power pack (set of 2)	Julian should be used in battery mode without a patient at least every 4 weeks. A fully charged battery should keep the workstation operating for at least 30 minutes. If not, get lead gel battery (set of 2) replaced by professionals. Must be replaced by professionals after 2 years. Must be disposed of in accordance with local waste disposal regulations.
Optical measuring set for determining the anaesthetic gas concentration	Must be checked by professionals every six months.
Time-keeper RAM	Must be replaced by professionals after four years. Must be disposed of in accordance with the local waste disposal regulations.
Inspection and maintenance	Must be carried out by professionals every six months

Cleaning the cooling air filters

– clean filters monthly.

1 Remove all three cooling air filters from their mount.

- Clean in warm water to which a detergent has been added; dry thoroughly.
- Insert the cooling air filters in their mount without creasing.
- Replace the cooling air filters after not more than one year. The filters can be disposed of as domestic waste.



Replacing the water separator

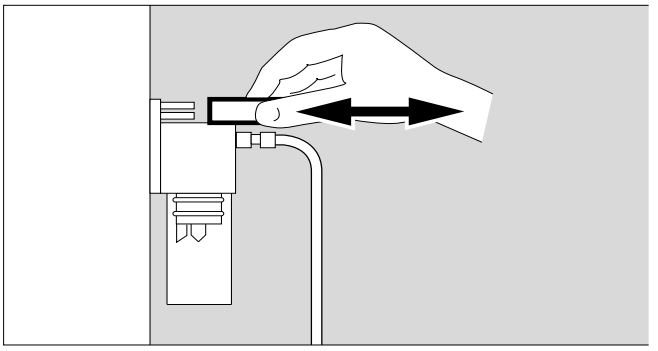
– Every two weeks

or

– When soiled
or

– When the message
CO_2 line? ! is displayed
(if the sample line is correctly installed and free of any blockage).

- Grip the water separator by its sides and pull it out.
- Push the new water separator into the holder as far as possible.
- The old water separator can be disposed of as domestic waste.



Replacing the "Waterlock" water trap:

- See separate Instructions for Use.

Replacing the O_2 sensor

– When the message
FIO_2 INOP! is displayed
or

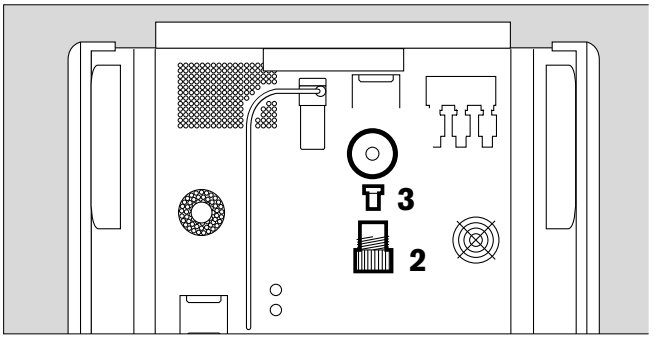
– when the sensor can no longer be calibrated.

2 Remove the screw.

3 Remove the spent O_2 sensor from the screw and insert a new O_2 sensor in the screw.

2 Refit the screw.

- Dispose of the spent O_2 sensor, see page 120.



Disposing of batteries and O_2 sensors

Batteries and O_2 sensors:

- must not be incinerated or thrown into a fire – risk of explosion!
- must not be opened forcibly – danger of chemical burns!
- must not be recharged.

Batteries must be handled as special waste:

- They must be disposed of in conformity with the local waste disposal regulations.

Spent O_2 sensors can also be returned to Dräger Medizintechnik GmbH.

Disposing of the used device

– At the end of its useful life.

Julian can be returned to Dräger Medizintechnik GmbH for disposal.

Fault – Cause – Remedy

Contents

Fault – Cause – Remedy

Julian divides the alarm messages into three priority classes identified by exclamation marks:
!!! Warning = Message with top priority
!! Caution = Message with middle priority
! Advisory = Message with least priority

The messages are listed below in alphabetical order. The list is intended to help identify the cause of an alarm message and to remedy the fault rapidly.

Message		Cause	Remedy
AGAS INOP	!	Anaesthetic gas measurement faulty.	Call DrägerService.
AGAS MIX	!	Mixture of more than two anaesthetic agents present.	Scavenge system. Check fresh gas setting.
2nd AGAS	!	2nd anaesthetic agent recognized	Scavenge system if necessary. Check fresh gas setting. Wait for transitional phase.
AIR SUPPLY	!!!	Compressed air supply has failed. Central supply connector not plugged in.	Check connection to central supply.
		Compressed air hose kinked.	
		Air compressor failure.	Check compressor.
APNEA CO_2	!!!	Breathing/ventilation has stopped. No breath detected for 30 seconds.	**Patient must immediately be ventilated by hand!** Check ventilator setting. Ensure it is not disconnected.
		No breath detected for 60 seconds in the "MAN/SPONT alarm limits" alarm mode.	**Patient must immediately be ventilated by hand!** Check patient's spontaneous breathing ability.
APNEA PRESSURE	!!!	Breathing/ventilation has stopped. No change of pressure detected for 15 seconds.	**Patient must immediately be ventilated by hand!**
		Inadequate supply of fresh gas.	Check fresh gas setting.
		Leak in hose system.	Check that hose system is not disconnected.
		Patient connection open.*	Connect patient up correctly.
APNEA VOL	!!!	Breathing/ventilation has stopped. No expiratory tidal volume for 15 seconds.	**Patient must immediately be ventilated by hand!**
			Check patient's spontaneous breathing ability.
			Check ventilator setting.
		Inadequate supply of fresh gas.	Check fresh gas setting.
		Tube kinked. Leak in hose system.	Check hose system.

* In automatic ventilation mode and with PEEP = 0, due to its very low internal breathing resistances, the workstation can display a measured value for the minute volume. This display is irrelevant in conjunction with the message "APNOEA PRESSURE!!!".

Message		Cause	Remedy
AW TEMP ⌐▲	!!!	Breathing gas temperature above 40 °C.	If using a breathing gas humidifier: disconnect humidifier. If using heated breathing hoses: remove plug of hose heater.
AW TEMP INOP	!	Airway temperature sensor defective.	Check sensor lead. Replace sensor.
BATTERY LOW	!!!	The battery capacity of the uninterruptible power supply is almost exhausted.	Check patient's condition! Prepare manual ventilation with 100 % O_2.
CO_2/AGA INOP	!	CO_2 / anaesthetic gas measurement faulty, and consequently: aspiratory O_2 measurement faulty.	Call DrägerService.
CO_2 INOP	!	CO_2 gas measurement faulty.	Call DrägerService.
CO_2 LINE?	!	Sample line blocked.	Check sample line, filter in T-piece and watertrap, WaterLock or water separator; replace if necessary. Check that hose to anaesthetic gas scavenging system is not kinked.
COOLING ?	!	Internal temperature in apparatus is too high or fan for mixer electronics or DC/DC converter is defective.	Clean filter on the back panel. Call DrägerService.
EMERGENCY O_2 OPEN	!	O_2 emergency metering has opened in normal operation.	Close O_2 emergency metering.
ET CO_2 ⌐▲	!!	Upper alarm limit for end-expiratory CO_2 concentration has been exceeded for at least two breaths.	Check ventilation.
ET CO_2 ▼⌐	!!	End-expiratory CO_2 concentration has fallen below lower alarm limit for at least two breaths.	Check ventilation.
EXP MAC ⌐▲	!!	Upper alarm limit for expiratory MAC value has been exceeded.	Check Vapor setting. Check fresh gas setting.
FI HAL ⌐▲ FI ISO ⌐▲ FI ENF ⌐▲ FI DES ⌐▲ FI SEV ⌐▲	!!! !!! !!! !!! !!!	The inspiratory gas concentration of the relevant anaesthetic agent exceeds the upper alarm limit. The upper alarm limit has been exceeded for at least two breaths.	Check setting of anaesthetic vaporizer.
FI HAL ▼⌐ FI ISO ▼⌐ FI ENF ▼⌐ FI DES ▼⌐ FI SEV ▼⌐	!! !! !! !! !!	Inspiratory gas concentration of the relevant anaesthetic agent is below the lower alarm limit. The value has remained below the lower alarm limit for at least two breaths.	Check setting of anaesthetic vaporizer.
FI O_2 ▼⌐	!!!	Inspiratory O_2 concentration is below the lower alarm limit.	Check O_2 supply. Check O_2 concentration in fresh gas flow.
FLOW INOP	!	Flow sensor defective.	Replace flow sensor, page 108.

Message		Cause	Remedy
FRESH GAS ?	!!	Fresh gas setting too low.	Increase fresh gas flow.
		Leak	Repair leak.
GAS FAILURE	!!!	Failure of the O_2 and AIR supply.	Open backup O_2 cylinder. Check connection to central supply.
INSP CO_2 ⌐▲	!!	The inspiratory CO_2 concentration exceeds the upper alarm limit set.	Replace the soda lime in the anaesthetic unit system.
			Valve discs in breathing system defective.
			Set sample rate to 200 mL/min due to high frequency and time constant of CO_2 sensor.
INSP MAC ⌐▲	!!	Upper alarm limit for inspiratory MAC value has been exceeded.	Check Vapor setting. Check fresh gas setting.
MV ▼⌐	!!	Minute volume below the lower alarm limit.	Check breathing system. Check setting of ventilator.
		Tube blocked/kinked.	Check tube.
		Leak in breathing system.	Seal breathing system.
		Ventilation volume reduced by pressure limitation.	Correct ventilation pattern.
		Inadequate fresh gas flow.	Increase fresh gas flow.
MV ⌐▲	!!	Minute volume exceeds upper alarm limit.	Correct tidal volume or respiration rate.
N_2O SUPPLY	!!!	N_2O supply has failed.	Open the N_2O backup cylinder.
		The central supply connector is not plugged in or the N_2O hose is kinked.	Check connection to central supply. Restore N_2O supply.
		N_2O cylinder empty.	Connect a full N_2O cylinder.
NO FRESHGAS	!!!	Fault on switching over to the external fresh gas outlet.	Call Dräger Service.
O_2 INOP	!	O_2 sensor worn or defective	Replace O_2 sensor, page 119
O_2 SUPPLY	!!!	The oxygen supply has failed.	Open the O_2 backup cylinder.
		The central supply connector is not plugged in or the O_2 hose is kinked.	Check connection to central supply. Restore O_2 supply.
		O_2 cylinder empty.	Connect a full O_2 cylinder.
PAW ⌐▲	!!!	Airway pressure exceeds upper alarm limit.	Check hose system.
		Ventilation hose kinked.	
		Stenosis.	
		Pressure limit set too high.	Correct pressure limit.
PAW NEGATIVE	!!!	Inadequate supply of fresh gas.	Set adequate fresh gas flow on the anaesthetic unit.
		Mean pressure p_{mean} less than –2 mbar.	
		Airway pressure PAW less than –7 mbar.	

Message		Cause	Remedy
P MAX ?	!	PCV pressure limit not reached.	Seal the leak. Correct pressure limit, inspiratory flow or inspiration time if necessary.
POWER FAIL	!	Power supply failure.	Check battery capacity. Prepare manual ventilation.
		Short-circuit in one of the devices connected to the auxiliary sockets.	Remove the device plug from the auxiliary socket. Press the switch on the back panel.
PRESSURE LIMIT	!!	The ventilator is operating in pressure-limited mode. Lung compliance has changed. Tube kinked. Microbial filter clogged on the inspiratory side.	Check tube/microbial filter. If necessary, increase Pmax or reduce V_T
PRESSURE INOP	!	Pressure sensor defective.	Call DrägerService.
PRESSURE EXP ⌟▲	!!!	End-expiratory pressure is more than 10 mbar above the set PEEP.	Increase expiration time. Check hose system and microbial filter. Drain water trap.
PULSE SPO_2 ▼⌟	!!!	Pulse rate has dropped below the set alarm limit.	**Check patient's condition!**
PULSE SPO_2 ⌟▲	!!	Pulse rate exceeds upper alarm limit.	**Check patient's condition!** Correct alarm limit if necessary.
RS 232 COM	!	Communication via the RS 232 interface COM 2 has been interrupted.	Check the plug connection on Julian and the connected device.
SPO_2 ▼⌟	!!!	Oxygen saturation is below the set lower alarm limit.	Check ventilation.
			Check O_2 concentration of the fresh gas.
SPO_2 ⌟▲	!!	Oxygen saturation exceeds the upper alarm limit.	Check O_2 concentration of the fresh gas flow.
			Check ventilation.
SPO_2 INOP	!	SpO_2 measurement faulty.	Call DrägerService.
SPO_2 PULSE ?	!!!	No pulse signal detected by SpO_2 measurement for approx. 10 seconds.	**Check patient's condition!**
			Check SpO_2 sensor!
SPO_2 SENSOR?	!	SpO_2 sensor not plugged in.	Check sensor connection.
SPEAKER FAIL	!	No alarm tone, loudspeaker faulty.	Call DrägerService.
SYSTEM ERROR	!!!	Internal device error. Automatic switchover to MAN/SPONT.	
		Version without rotary knob for O_2 emergency metering: Julian automatically delivers an O_2 flow of 8 L/min.	**Immediately ventilate the patient by hand.**
		Version with rotary knob for O_2 emergency metering: Set »**Safety O_2**« rotary knob to desired O_2 flow. Range 0 to 12 L/min. This O_2 flow flows through the Vapor unit.	Set »**Safety O_2**« rotary knob for O_2 emergency metering to desired O_2 flow. Range 0 to 12 L/min. **Immediately ventilate the patient by hand.** Check Vapor unit setting. Call DrägerService.

Message		Cause	Remedy
VENT INOP	!!!	The ventilator control unit is performing an internal restart. This restart procedure takes about 30 seconds.	After about 30 seconds, Julian is restored to its previous operating mode.
WATER TRAP	!	The collecting jar of the water trap at the back of the unit is full.	Empty the jar.
		The prism of the water trap is misted over with condensation.	Wipe the prism dry. Exchange the watertrap, WaterLock.

What's what

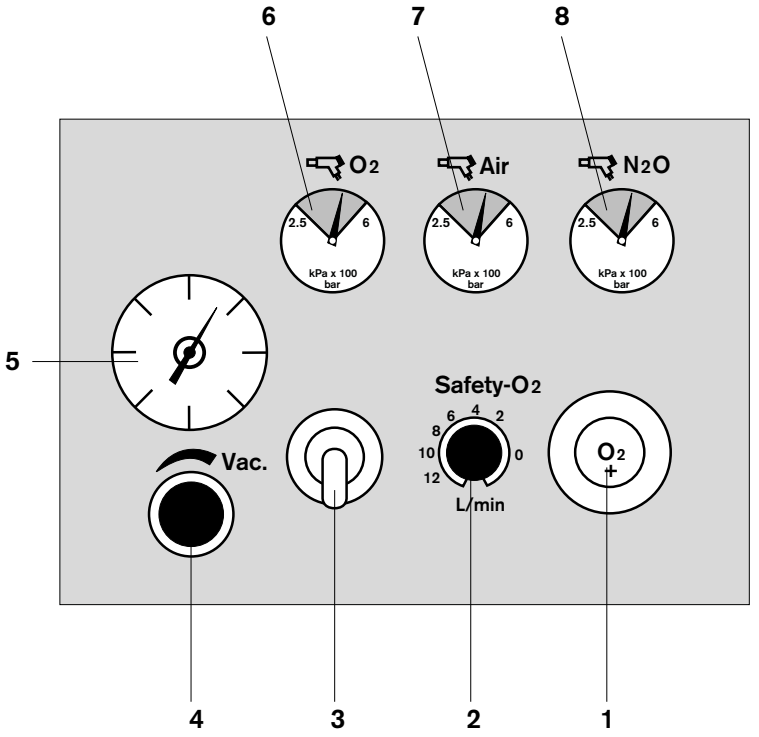
Contents

What's what

Front view

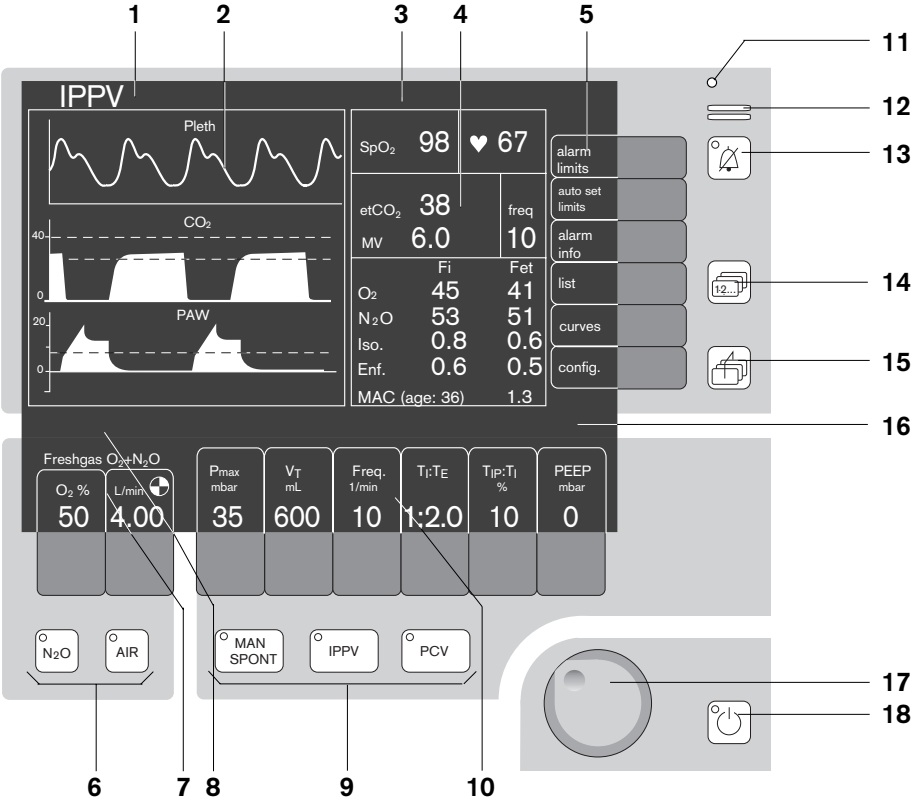
1 Screen with user interface
2 Rotary knob for selection, setting and confirmation
3 Main power switch
4 Writing top
5 Catch to unlock the breathing system
6 Bellows
7 Absorber
8 Drawer
9 Suction system
10 Bacterial filter for suction system
11 Compact breathing system
12 Gas supply panel (see page 129)
13 Vapors with interlock system
14 Mounting rail for accessories
15 Shelf for patient monitor

Gas supply panel



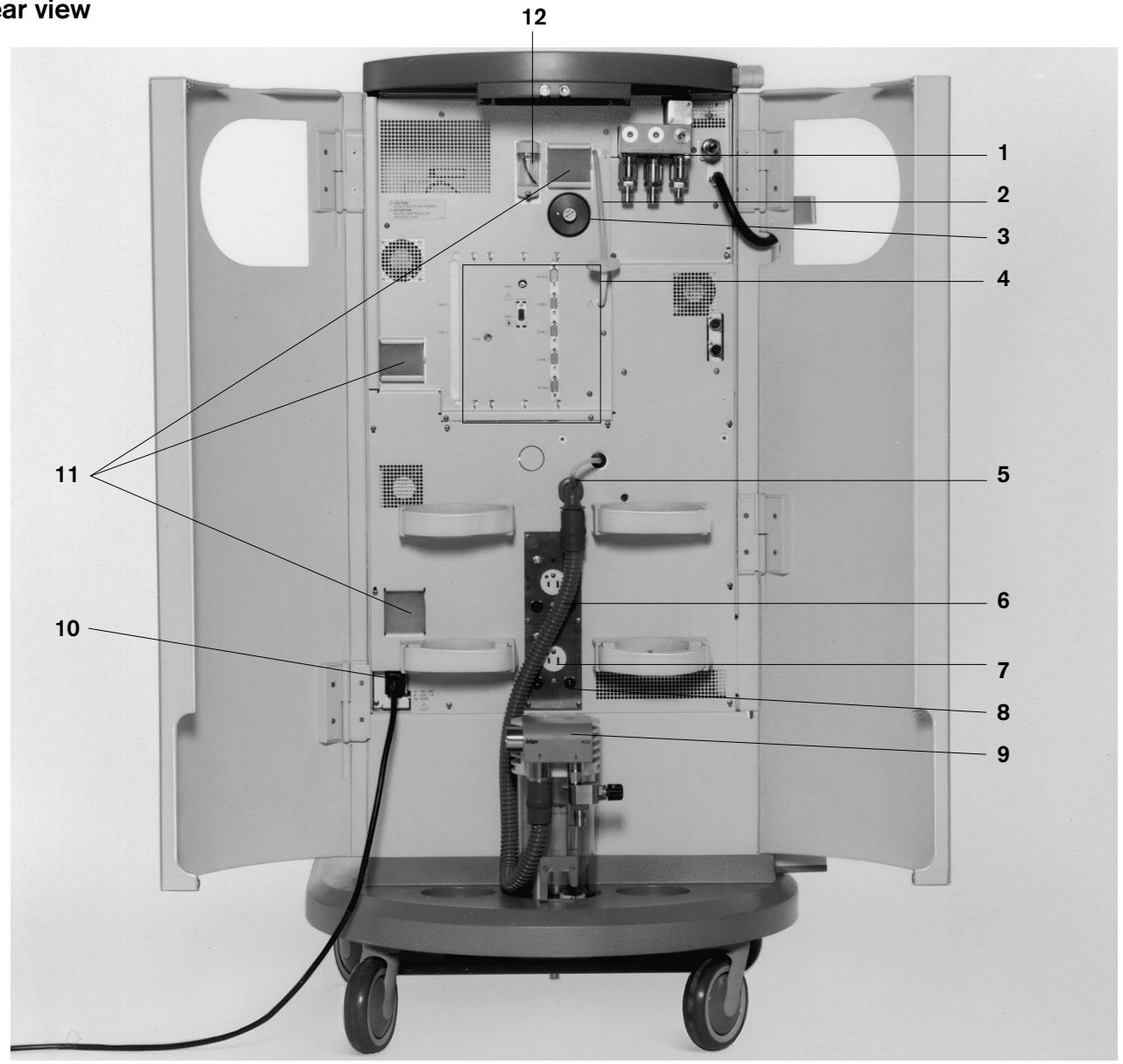
1 O_2 flush
2 Adjustable O_2 emergency metering (optional)
3 Secretion aspiration on/off switch
4 Rotary knob for secretion aspiration suction
5 Secretion aspiration pressure gauge
6 Central gas supply O_2 pressure gauge
7 Central gas supply AIR pressure gauge
8 Central gas supply N_2O pressure gauge

Screen with user interface



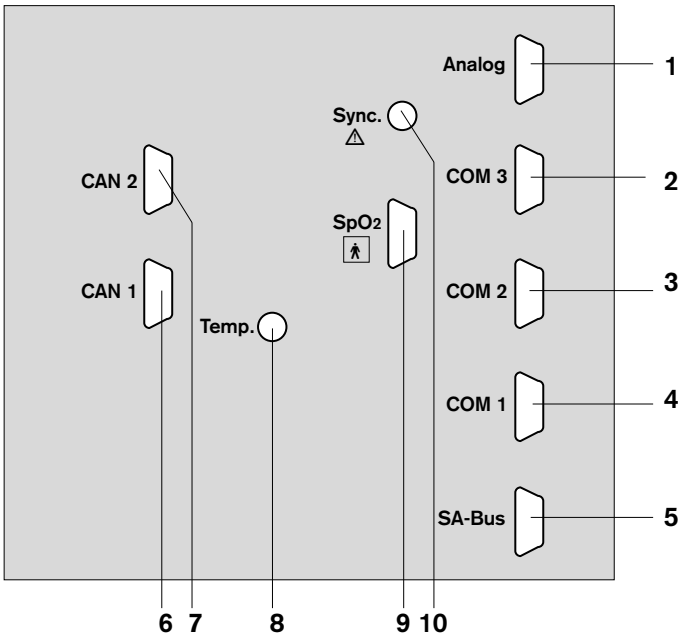
1 Status field showing the current ventilation mode
2 Curve field for curves and bar graphs
3 Alarm field for alarm messages and their priority
4 Measurement field for numerical values
5 Softkeys for monitoring functions
6 Keys for selecting the carrier gas (N2O or AIR)
7 Softkeys for setting the fresh gas flow
8 Status line for fresh gas
9 Keys for selecting the ventilation mode
10 Softkeys for setting ventilation
11 Power supply indicator
12 Alarm indication LEDs
13 Key for suppressing the acoustic alarm for 2 minutes
14 Key for changing monitoring screen pages
15 Key for calling up the standard screen
16 User advisory field
17 Rotary knob for selection, setting and confirmation
18 Key for switching to standby mode

Rear view



1 Gas supply ports
2 Sample gas return with filter
3 O_2 sensor (behind the sealing screw)
4 Interface panel
5 Waste gas connector
6 Transfer hose to anaesthetic gas scavenging system AGS
7 Auxiliary power sockets
8 Pin for earth cable
9 Anaesthetic gas scavenging system AGS
10 Power cable
11 Cooling air filters
12 Connection for sample line with water trap

Interface panel



1	Analog	Analog output for three curves
2	COM3	RS232 interface for MEDIBUS
3	COM2	RS232 interface for MEDIBUS (additional monitoring)
4	COM1	RS232 interface for printer
5	SA-Bus	For DrägerService only
6	CAN1	Interface for PM 8060 vitara (haemodynamic screen), optional
7	CAN2	Interface for parameter box PB 8800, optional
8	Temp	Socket for temperature sensor, optional
9	SpO_2	Socket for SpO_2 sensor, optional
10	Sync	Socket for C-Lock-ECG synchronization of the optional SpO_2 measurement

Technical Data

Contents

Technical Data

Ambient conditions

In operation:	
Temperature	10 to 35 °C
Air pressure	700 to 1060 hPa
Rel. humidity	20 to 80 % (no condensation)
CO_2 concentration of ambient air	300 to 800 ppm
In storage:	
Temperature	–20 to 60 °C O_2 sensor max. 50 °C
Air pressure	500 to 1100 hPa
Rel. humidity	<98 % (no condensation)

Fresh gas

(electronic mixer)

Settings:	
O_2 concentration	25 to 100% by vol., at least 25% by vol. or 250 mL/min ± 5% of set value
Fresh gas flow	0 and 0.5 to 12 L/min ± 10% of set value or max. ±100 mL
O_2 flush	>35 L/min

Ventilator

(electronically controlled, pneumatically driven bellows in bottle ventilator, fresh gas disconnected)

Settings:	
Pressure limit Pmax	
for IPPV	10 to 70 mbar
for PCV	(PEEP+1) to 70 mbar ±10 % of setting or at least ±2 mbar
Tidal volume	
for IPPV	50 to 1400 mL ± 15% of the setting for inspiration flows ≥ 10 L/min.
for PCV	20 to 1400 mL (result of the ventilation settings)
Ventilation frequency	6 to 60 per minute
T_{insp}	0.2 to 6.7 seconds
T_{exp}	0.33 to 8 seconds
Insp/Exp. time ratio T_I : T_E	1 : 4 to 2 : 1 with automatic ventilation
Plateau time ratio T_{IP} : T_I	0 to 50 %
Inspiratory flow (PCV)	5 to 50 L/min ±10 % Can be set to up to 75 L/min by DrägerService
Inspiratory flow (IPPV) (cannot be set directly; depends on the setting for V_T, Freq. T_I:T_E and T_{IP}:T_I)	3 to 75 L/min
PEEP	0 to 20 mbar at least ±2 mbar

Breathing system

Total gas volume (without breathing hoses)	Approx. 4.5 L enclosed gas volume
Compliance with filled absorber container, without breathing hoses	Approx. 4.5 mL/mbar
Absorber volume	1.5 L
Leakage (EN 740)	<150 mL at 30 mbar
Pressure limiting valve APL	
Adjustment range	5 to 70 mbar ±15 % of setting
Exp. resistance (EN 740)	4,8 mbar at 60 L/min
Insp. resistance (EN 740)	4,6 mbar at 60 L/min

absorber container filled with DrägerSorb 800 Plus

Fresh gas outlet for non-rebreathing system

Connection	dia. 22 ISO
Pressure	max. 80 mbar
Fresh gas flow	0; 0,5 to 12 L/min

Measuring systems

Pressure measurement
(piezoresistive)

Airway pressure	–10 to 99 mbar
Resolution	1 mbar
Accuracy	Better than ±4 % of measured value or at least 1 mbar, the larger value applies.

O_2 measurement
(fuel cell in sidestream)

Sample rate	60 mL/min or 200 mL/min
Delay time for sampling	Less than 1 second (for a sample rate of 200 mL/min)
Measuring range	5 to 100 vol%
Resolution	1 vol%
Accuracy	Calibration in air: ±3 vol% in the range from 5 to 50 vol% ±5 vol% in the range from 50 to 100 vol% Calibration with 100 % O_2: ±3 vol% in the range from 5 to 100 vol%
Drift	Within the ranges specified above
Response time $t_{10...90}$	
at 200 mL/min	500 ms
at 60 mL/min	1 s

Flow measurement
(hot wire anemometry)

Tidal volume VT	
Range	0.02 to 9.99 L
Resolution	0.01 L
Accuracy (under calibration conditions and 1013 hPa)	Better than ±8 % of the measured value or 0.01 L, the larger value applies
Minute volume MV	
Range	0 to 99.9 L/min
Resolution	0.1 L/min
Accuracy (under calibration conditions and BTPS*)	Better than ±8 % of the measured value
Respiration rate	
Range	0 to 60 per minute
Resolution	±1 per minute
Accuracy	±1 per minute

Airway temperature measurement
(NTC resistance)

Measuring range	20 to 50 °C
Resolution	1 K
Accuracy	±0.5 K in the range from 30 to 41 °C

CO_2 measurement
(infrared spectrometry)

Sample rate (selectable)	60 mL/min or 200 mL/min
Delay time for sampling	Less than 1 s (for a sample rate of 200 mL/min)
Response time t 10...90	
at 200 mL/min	300 ms
at 60 mL/min	1 s
Measuring range	0 to 9.9 kPa (0 to 80 mmHg)
Resolution	0.1 kPa
Accuracy	±0.2 vol% or 5 % of measured value

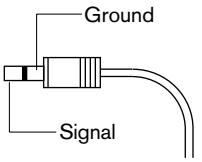
* BTPS: Body temperature, current atmospheric pressure, gas saturated

Anaesthetic gas measurement (infrared spectrometry)	**All data in % by volume at 1013 mbar current atmospheric pressure**
Sample rate (selectable)	60 mL/min or 200 mL/min
Delay time for sampling	Less than 1 s (for a sample rate of 200 mL/min)
Response time t 10...90	
at 200 mL/min	300 ms
at 60 mL/min	1 s
Accuracy	The measurement accuracy required by DIN ISO 11196 is attained at the latest 4 minutes after switching on the apparatus. The threshold for automatic detection is 0.15% by volume. To check the complete accuracy of Julian, a temperature stabilisation time of 1 hour at 21°C should be observed. The accuracy of the measuring equipment used should be at least 5 times and if possible 10 times higher than that of Julian.
Display range for N_2O	0 to 100 vol%
Resolution	0.1 vol%
Accuracy	Better than ±2 vol% absolute or ±3 % of measured value
Display range for halothane	0 to 8.5 vol%
Resolution	0.1 vol%
Accuracy for	
0 to 4 vol%	0.15 vol% or 5 % of measured value
>4 to 8.5 vol%	±10 % of measured value
Display range for isoflurane	0 to 8.5 vol%
Resolution	0.1 vol%
Accuracy for	
0 to 5 vol%	0.15 vol% or 5 % of measured value
>5 to 8.5 vol%	±10 % of measured value
Display range for enflurane	0 to 9.9 vol%
Resolution	0.1 vol%
Accuracy for	
0 to 54 vol%	0.15 vol% or 5 % of measured value
>4 to 9.9 vol%	±10 % of measured value
Display range for sevoflurane	0 to 9.9 vol%
Resolution	0.1 vol%
Accuracy for	
0 to 6 vol%	0.15 vol% or 5 % of measured value
>6 to 9.9 vol%	±10 % of measured value
Display range for desflurane	0 to 22 vol%
Resolution	0.1 vol%
Accuracy for	
0 to 15 vol%	0.15 vol% or 5 % of measured value
>8 to 22 vol%	±10 % of measured value
Automatic anaesthetic gas identification	Volatile anaesthetic agents are automatically identified. Manual selection is not necessary and not possible. In the case of a mixture of two volatile anaesthetic agents, the concentration of the secondary anaesthetic agent is displayed from a MAC value of 0.1 MAC. A secondary anaesthetic agent becomes the main anaesthetic agent if its MAC value exceeds the MAC value of the main anaesthetic agent by 0.2 MAC. If a mixture of more than 2 volatile anaesthetic agents is present, the display is blank.
Cross-sensitivity	None with respect to alcohol, acetone, methane, NO and CO.

SpO_2 measurement, optional
(light absorption)

Display range	0 to 100 % SpO_2
Accuracy (adults)	
between 70 and 100 % SpO_2	Better than ±2 % SpO_2
between 50 and 70 % SpO_2	Better than ±3 % SpO_2
between 0 and 50 % SpO_2	Not specified
Accuracy (neonates)	
between 70 and 95 % SpO_2	Better than ±3 % SpO_2
between 0 and 70 % SpO_2	Not specified
between 95 and 100 % SpO_2	Not specified
Actualization time	Once per heartbeat
Pulse rate	20 to 250 per minute
Accuracy	±2 per minute
Sensors	
Type	Compatible with Nellcor sensors Oxisensor, Oxiband and Durasensor
Wavelengths	660 nm (red) 920 nm (infrared)
Acoustic pulse signal	A tone is produced for each detected pulse, tone pitch proportional to oxygen saturation

C-Lock-ECG synchronization (optional)

Requirements for ECG synchronization signal	Pos. pulse with voltage >4.5 V, >10 ms duration for driving 2 mA
Max. permissible signal delay with reference to current QRS complex	40 ms
Socket for 2-pin jack-plug, dia. 3.5	
Jack layout	
Signal isolation from other electronic components	
Dielectric strength	4 kV

Interfaces

Analog output	
Plug connector	9-pin sub-D, electrical isolation 1.5 kV
PAW	0 to 100 mbar; 0 to 5 V =; PIN 3
Flow	0 to 150 L/min; 0 to 5 V=; PIN 6
CO_2	0 to 10 kPa; 0 to 5 V=; PIN 9
Earth	PIN 1, 4, 7

COM1 record (printer)	
Connector	9-pin sub-D, electrical isolation 1.5 kV
Pin assignment	1 shield 2 TxD 3 RxD 5 GND
COM2 (MEDIBUS 1)	
Connector	9-pin sub-D, electrical isolation 1.5 kV
Pin assignment	1 shield 2 TxD 3 RxD 5 GND
COM3 (MEDIBUS 2)	
Connector	9-pin sub-D, electrical isolation 1.5 kV
Pin assignment	1 shield 2 TxD 3 RxD 5 GND

Operating data

Operating voltage	90 – 265 V~
Power input	400 W typically, max. 2.3 kW
Uninterruptible power supply	with fully charged battery: typically 30 min (auxiliary sockets are not powered!)
Mains fuse	Automatic circuit-breaker 10 A
Auxiliary sockets	Each with two fuses 2 A T2L 250V DIN 41662, IEC 127-2/III
Medical gas supply	
O_2	2.7 to 5.5 bar
N_2O	2.7 to 5.5 bar
AIR	2.7 to 5.5 bar
Drive gas consumption	
Operation	MV +1 L/min AIR or O_2
Standby and MAN/SPONT	0 L/min
Dimensions of Julian W x H x D	68 cm x 133 cm x 68 cm
Dimensions of the storage tray W x D	43 cm x 29 cm
Dimensions of the breathing system W x H x D	31 cm x 35 cm x 21 cm
Weight of Julian (Ready for operation without Vapor units and gas cylinders)	Approx. 90 kg
Weight of breathing system without soda lime	4.8 kg
Screen	Electro-luminescent screen, 10.4" diagonal
Protection class	
Device	I, type B conforming to EN 60601-1
SpO_2 sensor	Type BF  electrically isolated from protective earth

Electromagnetic compatibility EMC	Tested to EN 60601-1-2
Classification according to Directive 93/42/EC Appendix IX	Class II b
UMDNS Code Universal Medical Device Nomenclature System	10-134
Latex	Julian is latex-free. For latex-free use, latex-free breathing bag and breathing hoses should be used with Julian.

Abbreviations / Symbols

Contents

Abbreviations

Abbreviation	Meaning
AGas	Anaesthetic gas
AGS	Anaesthesia Gas Scavenging System
AIR	Compressed air for medical use
APL	Adjustable Pressure Limitation
BTPS	Measuring condition at body temperature, current atmospheric pressure and saturated gas
CE 0123	Conformité Européenne Directive 93/42/EC on Medical Products
CC-Lock	The SpO_2 signal is synchronized with the ECG signal
Compl.	Compliance
Des.	Desflurane
$etCO_2$	End-expiratory CO_2 concentration
Enf.	Enflurane
Fet	End-expiratory fraction
Fi	Inspiratory fraction
Fi Des	Inspiratory desflurane concentration
Fi Enf	Inspiratory enflurane concentration
Fi Hal	Inspiratory halothane concentration
Fi Iso	Inspiratory isoflurane concentration
Fi Sev	Inspiratory sevoflurane concentration
FLOW	Expiration flow
Fi CO_2	Inspiratory CO_2 concentration
Fi O_2	Inspiratory O_2 concentration
Hal.	Halothane
HLM	Alarm mode for heart-lung machine
INOP	Function failure
IPPV	Intermittent Positive Pressure Ventilation
Iso.	Isoflurane

Abbreviation	Meaning
MAC	Minimum Alveolar Concentration
MAN/SPONT	Manual ventilation / spontaneous breathing
MEAN	Mean pressure
MV	Expiratory minute volume
N_2O	Nitrous oxide (laughing gas)
NiBP	Non-invasive blood pressure
O_2	Oxygen
Pa	Pascal (1mbar = Pa x 100)
PAW	Airway pressure
PCV	Pressure Controlled Ventilation
PEAK	Peak pressure
PEEP	Positive end-expiratory pressure
Plateau	Plateau pressure
Pleth	Plethysmogram
Pmax	Maximum pressure
Sev.	Sevoflurane
SpO_2	Functional O_2 saturation
Tip:Ti	Ratio of inspiratory pause time to inspiration time
T_I:T_E	Ratio of inspiration time to expiration time
USV	Uninterruptible power supply
VAC	Vacuum (e.g. for secretion aspiration)
V_T	Tidal volume
ZV	Piped medical gas supply for O_2, N_2O, AIR and vacuum

Symbols

Symbol	Meaning
	Suppress alarm tone for 2 minutes
	Call up standard page
	Call up basic pages in succession
	Standby / operation switch
	Pulse rate
	Fresh gas flowing
	Action in progress
✓	Action has been completed successfully
?	Repeat calibration
	Upper and lower alarm limits
	Upper alarm limit only
	Lower alarm limit only
	Alarm monitoring inactive
– –	Alarm limit deactivated
* * * *	Enter 4-digit password
!	Advisory message
!!	Caution message
!!!	Warning message
	Protection class type B (body)
	Protection class type BF (body floating)
	Connection for equipotential bonding
	Connection for equipotential bonding
	Close menu, back to previous menu
	Connection for non-rebreathing systems
 >XX min	Available operating time with uninterruptible power supply UPS

Index

These Instructions for Use apply only to
Julian
with Serial No.:

If no Serial No. has been filled in by Dräger these Instructions for Use are provided for general information only and are not intended for use with any specific machine or device.

CE 0123

Directive 93/42/EEC
concerning Medical Devices

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